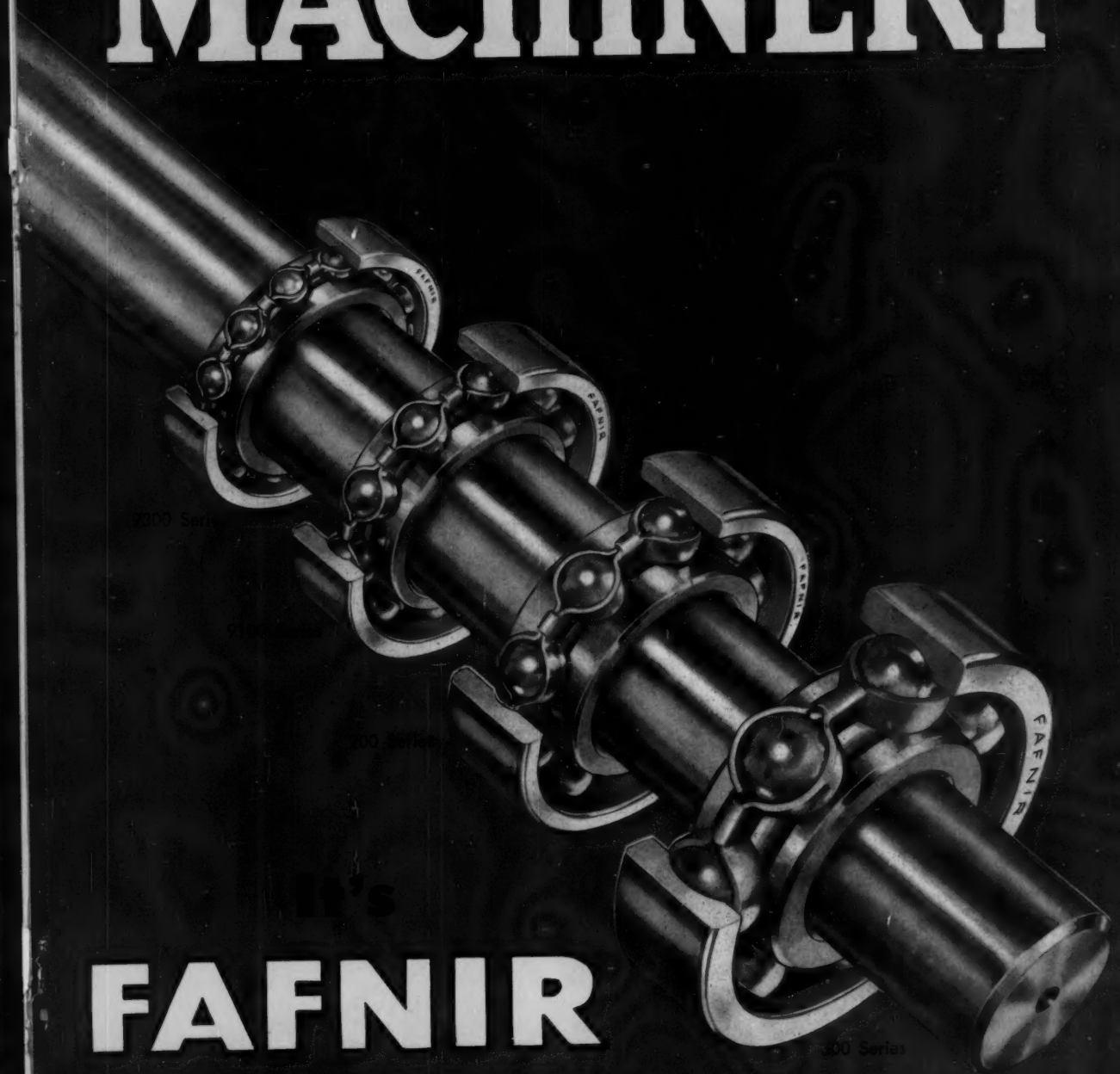
MACHINERY



200 Series

300 Series

300 Series

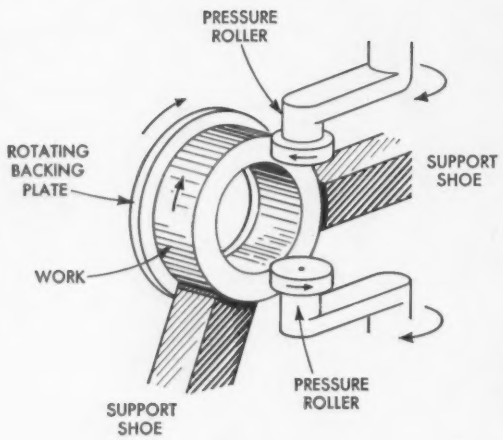
...it's FAFNIR 4 for 1

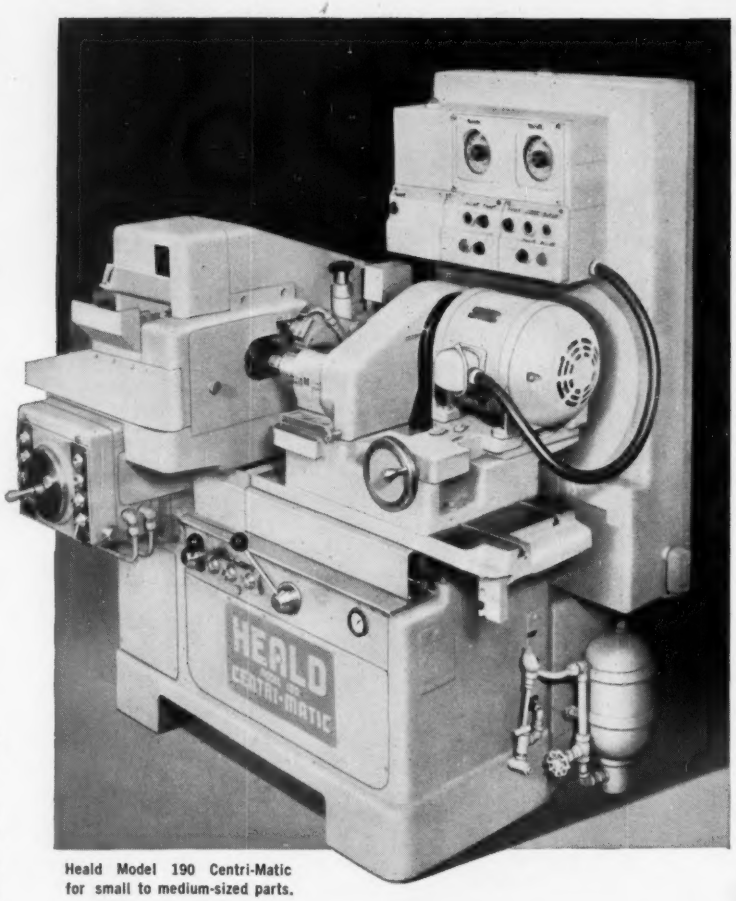
With this combination, you have the best chance of getting the most ball bearing for your money. Fafnir offers four different series of standard radial ball bearings, all with the same shaft or bore size but designed for lighter or heavier loads. Let Fafnir help you select the most economical bearing for the job.

THE FAFNIR BEARING COMPANY, New Britain, Connecticut

MEET THE NEW HEALD

Centri-Matic





Heald Model 190 Centri-Matic for small to medium-sized parts.

Now thoroughly field tested and proved in service, the new Centri-Matic joins the Heald line of fully automatic centerless internals.

Basically, it differs from the roll-type centerless in that the work is located on *fixed support shoes* and is driven by a rotating backing plate against which it is held (see diagram above). The greater contact area of the support shoes tends to bridge any irregularities in the O.D., thus reducing the possibility of reproducing O.D. errors in the ground I.D.

Available in the Model 190 for small or medium-sized work and in the Model 291 for larger parts, the Centri-Matic is ideally suited to conveyor systems and automated work handling devices. Like other Heald internals, it maintains consistent high precision over the longest production runs. Model 190's are designed primarily to operate with central hydraulics in battery setups. Centri-Matic machines are furnished with belt or high-frequency wheelhead drive and with Size-Matic or Gage-Matic sizing method. For complete details, write for Bulletin No. 2-190-1.

The new Centri-Matic is another good reason why IT PAYS TO COME TO HEALD!

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

HEALD®

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MACHINERY

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The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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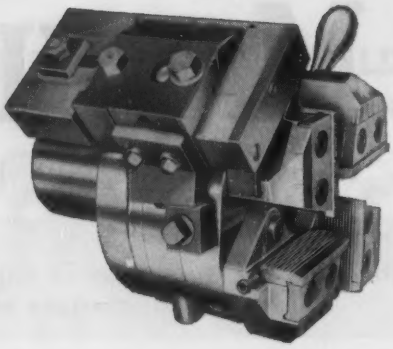
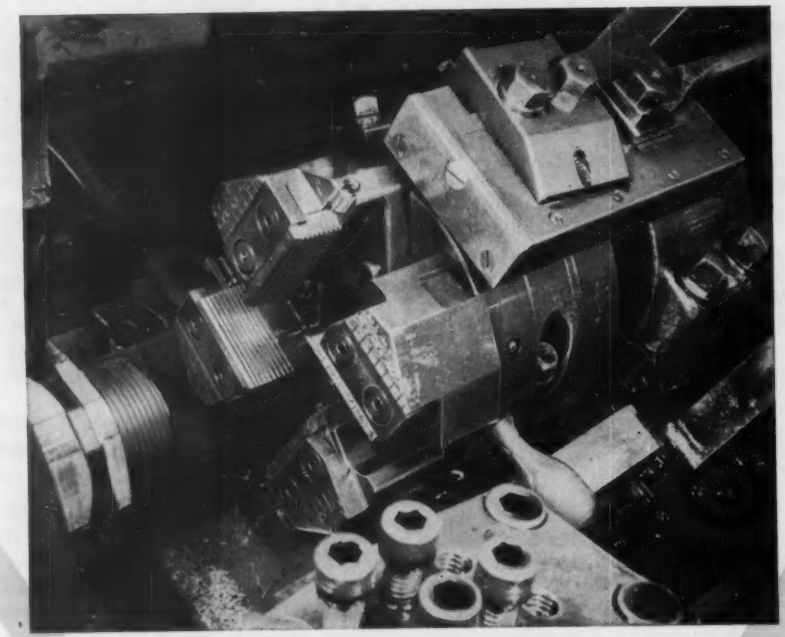


STAINLESS STEEL



TAPERED THREADS

cut with Better Finish Longer Tool Life

1½" Tapered Pipe Threads are cut in 304 stainless steel reducing bushings at Camden Machine Company, New Haven, Conn. These threads are produced by a 1¼" LANDMATIC Taper Attachment Head on a 3¼" Gridley single-spindle automatic at 15 surface feet per minute.

The thread finish is greatly improved from previous methods and 1000 pieces are completed between chaser grinds—an increase of more than 10 times.

These improved results can be entirely attributed to the use of the Taper Attachment and the free cutting action of the Landis Tangential Chaser. In operation, as the die head advances onto the workpiece, the movement of the die head cam along the cam follower of the taper attachment expands the chasers on diameter. This produces a tapered thread corresponding to the taper of the cam follower. Cutting action is limited to the throat section or chamfer of the chaser, allowing the thread to be cut quickly with little "cold-working." This action reduces cutting strains to a minimum and results in uniform tapered threads.

LANDIS Taper Attachment Heads are stationary self-opening heads for cutting tapered threads of all types. Six sizes of heads thread all diameters from ¼" to 6".

When writing for additional information, ask for Bulletin F-90.

THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A 414-C

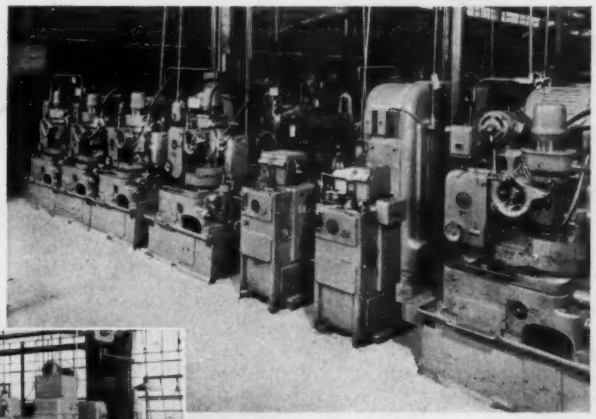
HOW TO TOOL UP FOR Ver

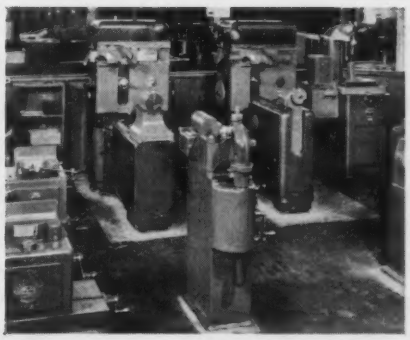
18 GEAR SHAPERS start with a pair of late model 36-Type Machines and run down the size range to two modern 3-Inch Fine-Pitch Machines

THE Fellows

satility

The Steel Products Engineering Co., Springfield, Ohio pins its faith to FELLOWS gear production equipment FOR ALL SIZE CLASSIFICATIONS





7 FELLOWS GEAR INSPECTION INSTRUMENTS include Red Liners and Involute Measuring Instruments

Equipped with Fellows Gear Shapers of different sizes ranging in capacity from 3″ up to 36″ along with Fellows Inspection Instruments for checking gear profiles, tooth accuracy, etc.... this well organized precision shop can profitably handle jobs in *all* size classifications. They cut fine instrument gears of Aircraft Quality... small and large diameter internal gears... cams, ratchet teeth, interrupted profiles, segment gears, and many unusual contours possible only with the Fellows Method.

In addition to the versatility of Fellows Gear Shapers, another feature that pays off for Steel Products is the quick and easy change-over from one job to another on these machines... a very important cost factor when frequent job changes and both long and short runs are involved.

Our Sales Engineers can give you the facts about the value of Fellows equipment in your plant. Call our nearest office.

GEAR SHAPER COMPANY

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You Automatically Balance on Cincinnati Filmatic Plain

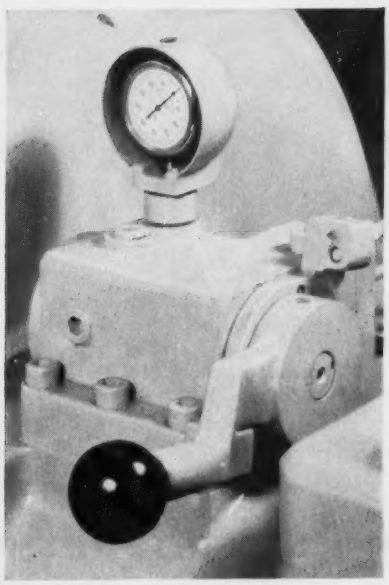
. . . quicker than you can read this headline

CINCINNATI

Automatic Wheel Balancing is now standard equipment on CINCINNATI FILMATIC 6", 10"-L, 10", 14"-L, 14" and 16" Plain Grinders, and on 6", 10"-L, 10" and 14"-L Angular Feed Plunge Grinding Machines. (Extra equipment, other sizes.)
In the illustration below, the operator shows how easy it is to balance the grinding wheel on a 10" x 72" Plain Hydraulic Grinder.

the Grinding Wheel and Roll Grinders

FILMATIC



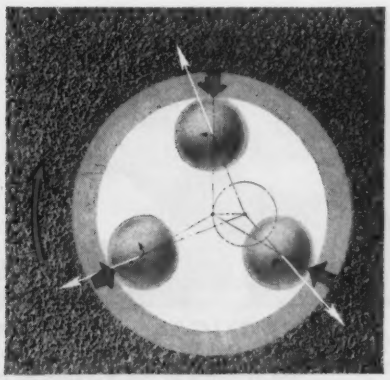
Automatic balancing control lever and indicator.

Have you ever seen an operator balance a grinding wheel mount on conventional static balancing ways? It's a tedious operation. If he's lucky, the wheel will balance within about 15 minutes; if he's not so lucky, it may require an hour or more! Cincinnati did something about this. They developed automatic grinding wheel balancing that does the job ten times more accurately and infinitely quicker and easier.

> *This exclusive Cincinnati feature* automatically balances the grinding wheel mount on the machine . . . within a few seconds . . . while the spindle rotates at its operating speed. *This exclusive Cincinnati feature* eliminates vibration and resultant chatter on the work . . . permits more effective stock removal . . . reduces wheel cost per workpiece.

FILMATIC spindle bearings and automatic grinding wheel balancing constitute a team that just can't be beat for lower cost precision cylindrical grinding. Best of all, these features are *standard equipment* on CINCINNATI FILMATIC 6", 10"-L, 10", 14"-L, 14" and 16" Plain Grinders, and on 6", 10"-L, 10" and 14"-L Angular Feed Plunge Grinding Machines. Write today for the complete balancing story. Ask for publication No. G-637-1.

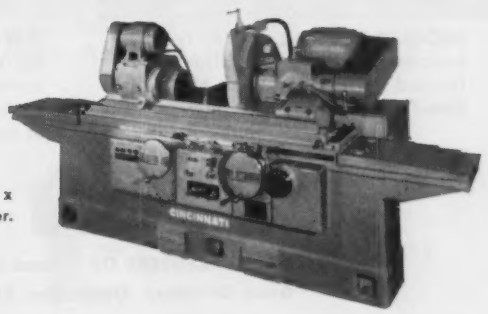
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



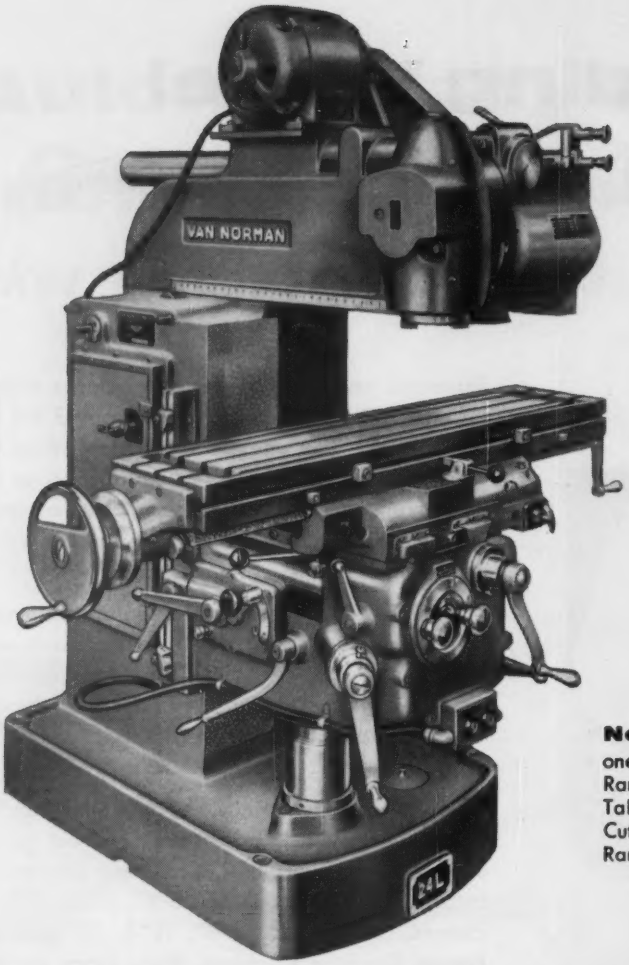
Here's how it works. Three steel balls are carried in a raceway in the wheel end of the spindle. As the spindle rotates while the elastically supported bearing assembly is unclamped, the balls are free to move and correct any unbalanced condition that may exist. Then the complete spindle and bearing assembly is locked in position to form a rigid mounting, and retain all the advantages of FILMATIC bearings for precision cylindrical grinding.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

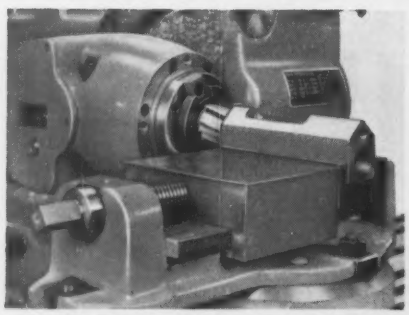


CINCINNATI FILMATIC 10" x 36" Plain Hydraulic Grinder. Catalog No. G-603.

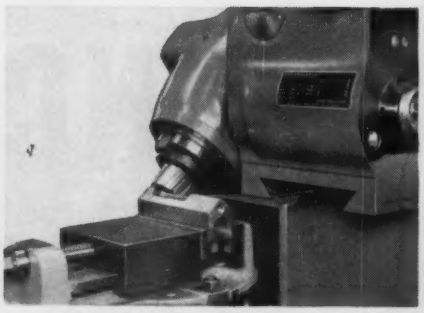


No. 24 L...
one of 10 new Van Norman
Ram-Type Millers.
Table Size: 45″ x 10½″
Cutterhead Motor: 3 HP
Ram Travel: 29″

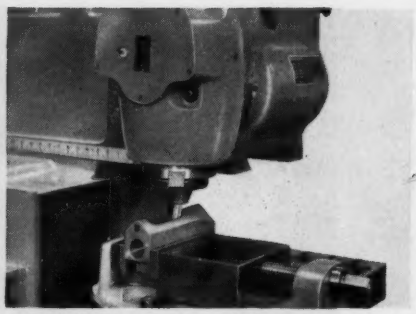
Here's how you eliminate idle machine time by as much as 50%...increase production



HORIZONTAL — A typical horizontal milling operation performed on the new Van Norman Ram-Type Miller.



ANGULAR — An angular milling operation performed on the same workpiece. Note workpiece remains in the same set-up. Angular range of cutterhead 0°-90°.



VERTICAL — With the cutterhead locked in vertical position a slot is milled in the workpiece. Note the set-up has not been changed.

VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

You Don't Need TWO Single-Purpose Machines plus Attachments when ONE VAN NORMAN Ram-Type Milling Machine Does the Same Work at Lower Cost

A single investment in *one* Van Norman Ram-Type Milling Machine gives you the equivalent of two separate millers plus attachments at the much lower cost of a single machine. Not only do you save machine purchase dollars, but with a Van Norman you get increased production with substantial savings in milling costs.

10 new models with cutterhead motors ranging from 1½ HP to 10 HP and table sizes from 37½″x 9⅜″ to 64″x 14″ give you a wide range of selection. Write for complete information today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

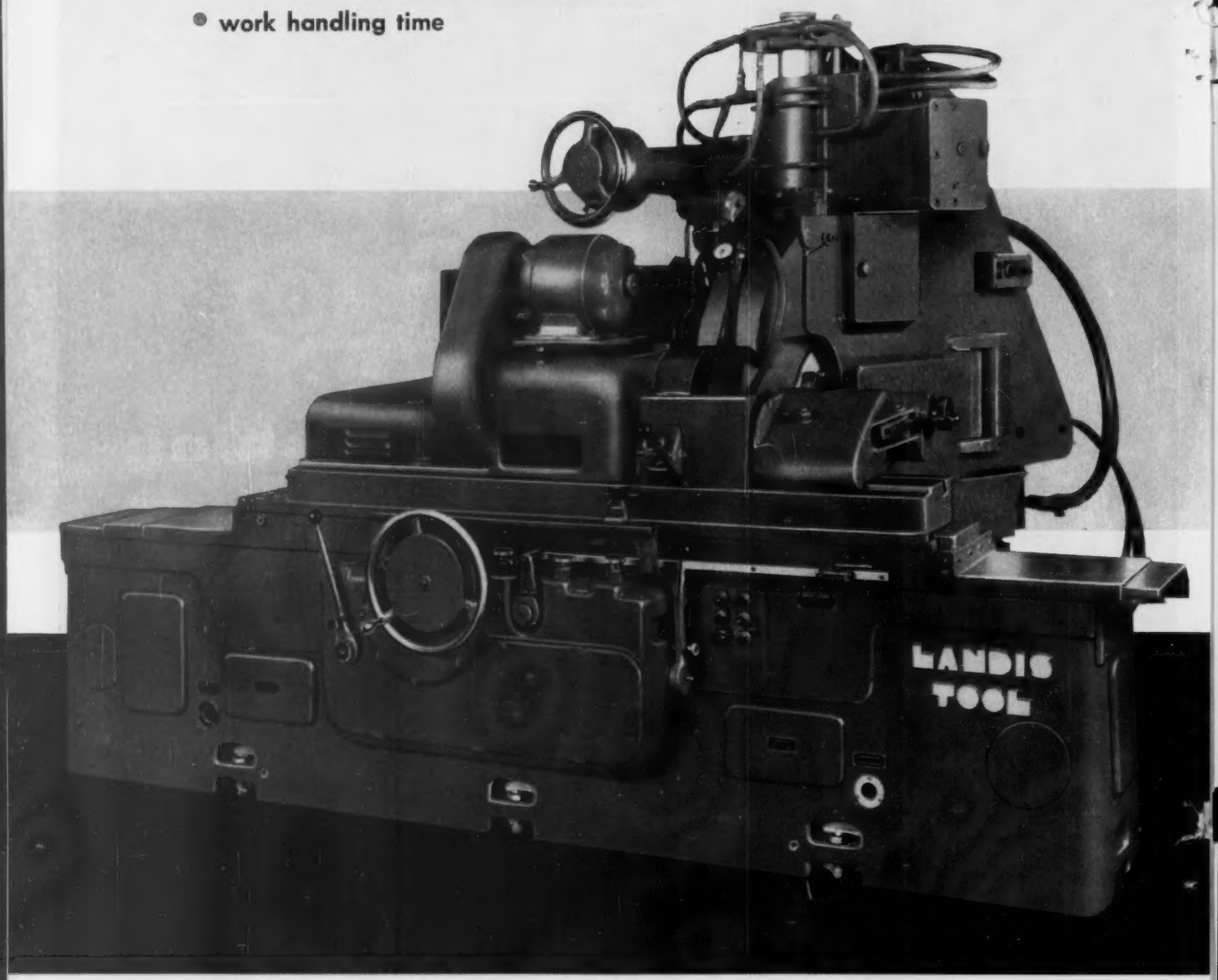
Lease and Conditional Sales Contracts not available to Export.

COMPANY | SPRINGFIELD 7, MASSACHUSETTS

How to Cut Grinding Costs

This Landis engineered method saves:

- investment in an additional machine
- production cost of extra operations
- work handling time



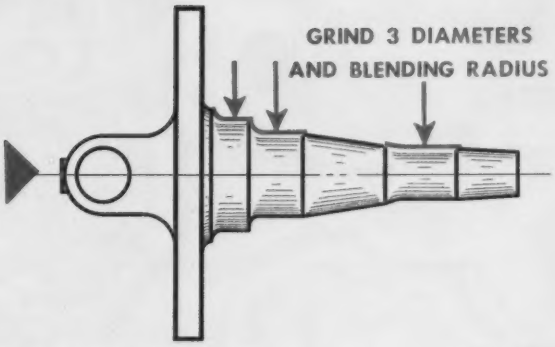
Landis 10" x 36" Type CH Plain Grinder with wheelbase set at 30°.
Overhead, hydraulically operated profile dresser.

LANDIS

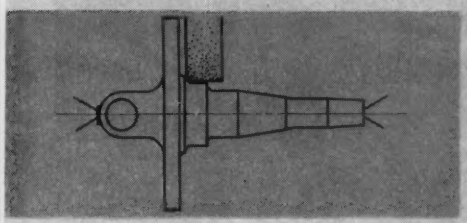
precision grinders

by Combining Operations

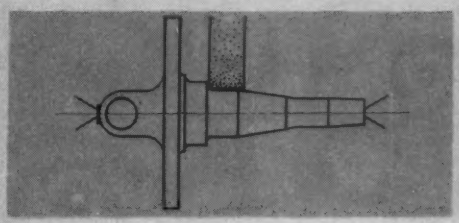
here's an example



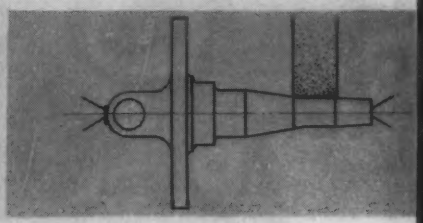
old fashioned method—3 operations



operation No. 1



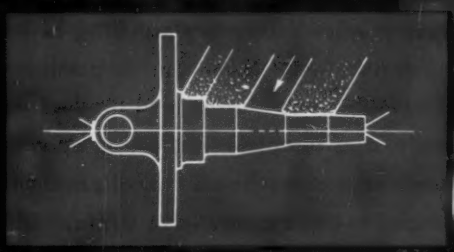
operation No. 2



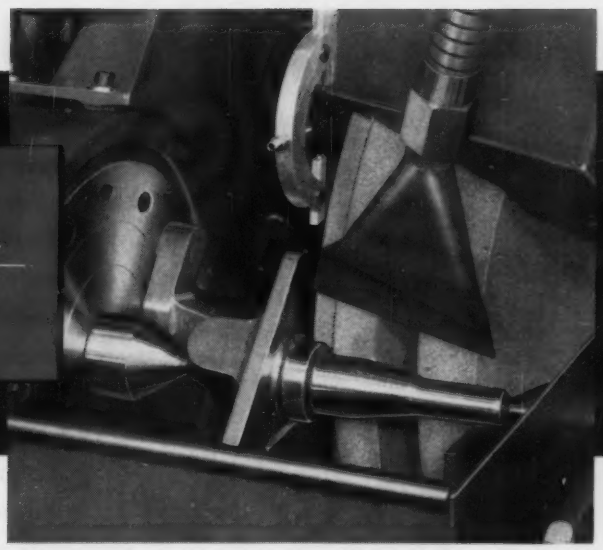
operation No. 3

modern method

Landis angle wheelbase grinding



only 1 operation!



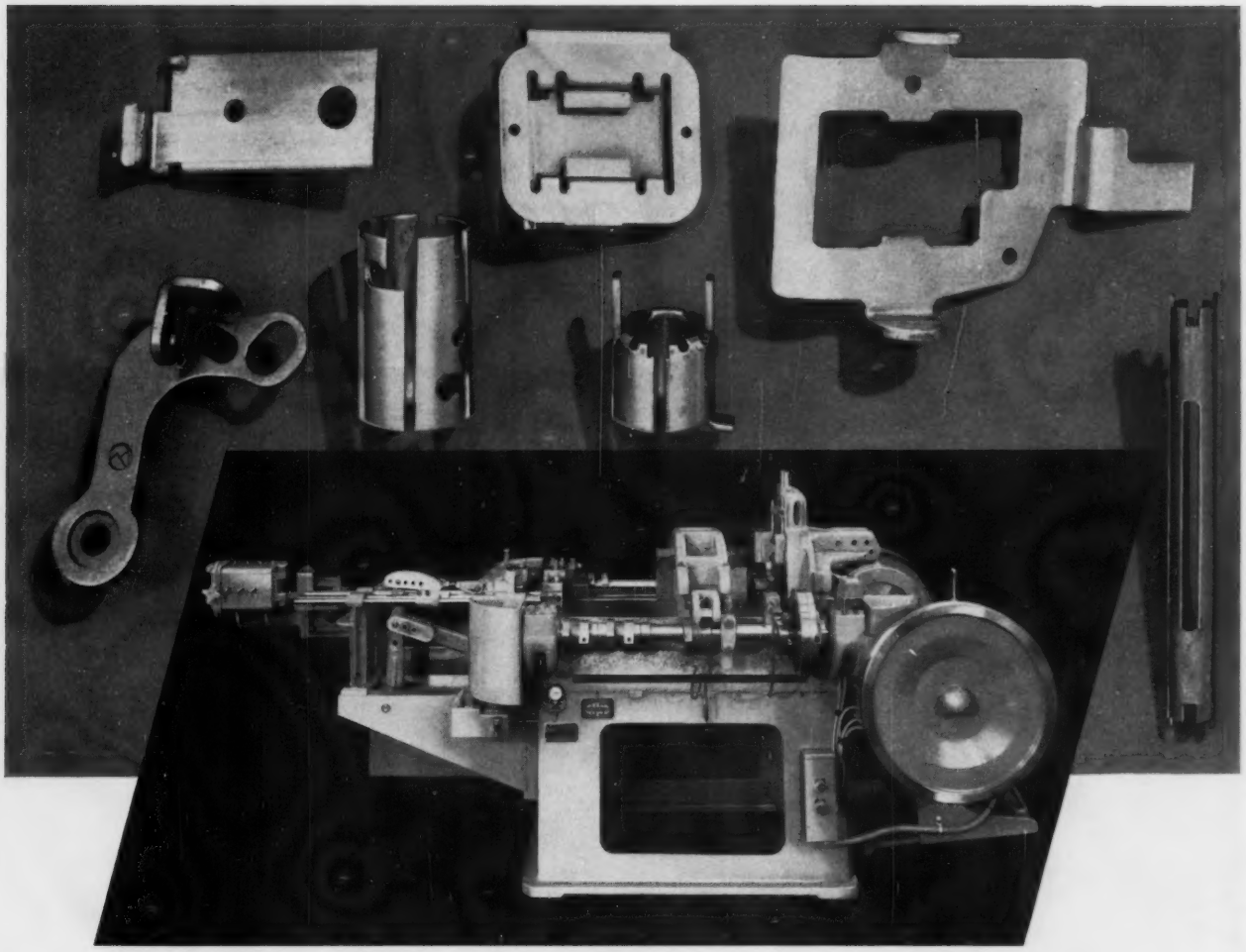
Three Diameters and Three Blending Radii of front wheel spindles are ground in one operation. Grinding is performed with spaced wheels on a wheelbase set at 30° angle. Stock removal is .015" on diameter and .009" on faces. Limits are .0005" on diameter and .010" on radius.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

For Automatic Production of Precision Stampings

THE U. S. MULTI-SLIDE®

In the production of precision stampings, every secondary operation, every inspection, every handling helps to send your costs UP! You can keep these costs at a minimum by using U. S. Multi-Slide Machines to produce parts rapidly, accurately, and complete in a single operation. The illustration above shows some typical parts which have been produced in this manner in U. S. Multi-Slides. These parts—of copper, aluminum, brass and steel—illustrate the variety of operations, including piercing, trimming, swaging, coining, blanking and forming, which can be performed in any combination in a U. S. Multi-Slide.



The No. 33 U. S. Multi-Slide, with capacity for material up to 2½" wide, feed length adjustable up to 12½".

Many of these parts formerly required costly secondary operations and intermediate inspections. Now they are produced uniformly and to close tolerances in a single high-speed operation.

U. S. Multi-Slides are built in four sizes.

Illustrated is the No. 33 Machine, with capacity for material up to 2½" wide and feed length adjustable up to 12½".

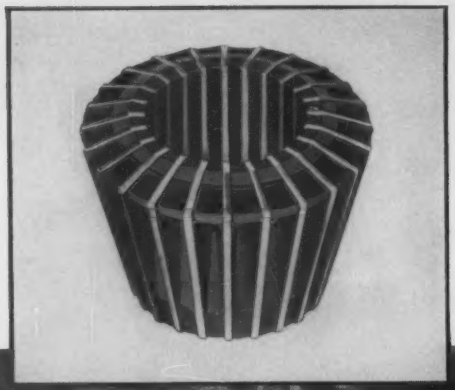
If your program involves the production of precision stampings, investigate the labor-saving, time-saving features of U. S. Multi-Slides. Ask for a copy of Bulletin 15-M containing complete specifications.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

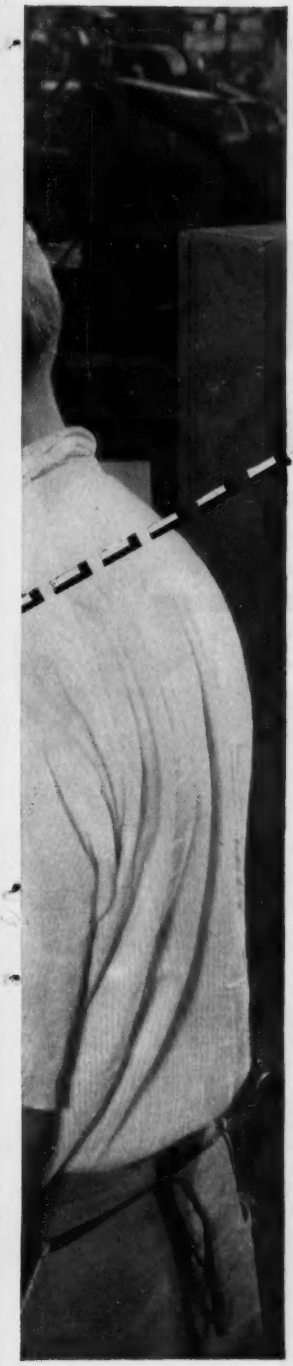


Once again!...

Jacobs doubles

production rate–

grinds 100% faster



Leading chuck manufacturer uses Norton machines to cut grinding time in half

When a leader like The Jacobs Manufacturing Company selects equipment, you can be sure that this equipment has had careful study from every angle of performance and cost.

That's why Jacobs' choice of Norton grinding machines is worth serious consideration when *you* are buying grinding machines.

In producing their famous Rubber-Flex Collets, for example, Jacobs reports that switching from separate operations to a single operation on Norton Type CTU Semiautomatics with multi-wheel mounts has doubled their production rate. *Jacobs reported similar production savings in grinding chuck bodies on the same type of Norton machines.*

Another manufacturer has boosted production from 300 to 600 parts per hour by grinding 2 diameters at once on a Norton machine. Still another reports that a Norton grinding machine with a triple-wheel mount has upped his production rate 128%. Throughout industry, manufacturers are using Norton grinders and lappers to save time, work and money in grinding operations.

Norton Machines in Your Own Grinding bring the same profit-increasing advantages. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

For further facts, see your Norton Representative, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: West Hartford • New York (Teterboro, N. J.) • Cleveland • Chicago • Detroit

In the Jacobs Plant. One of the Norton 6" Type CTU Semiautomatic Grinding Machines used by The Jacobs Manufacturing Company of West Hartford, Connecticut, to grind metal inserts in the famous Rubber-Flex Collets. The basically fast action of this Norton grinder, the multi-wheel mount, special swivel table arrangement and wheel-truing device provide a single setup for traverse and shoulder grinding operations that boosts production rate 100%.

WINTER TAPS HAVE BALANCED *Action*

To lower your cost of tapped holes, put Winter BALANCED ACTION Taps to work for you. ALL have uniform flute contours; exact flute spacing; accurate and concentric chamfers; and precision chip driver contours.

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Division of National Twist Drill & Tool Co.

WINTER GAGES
Are Now Available

from your Winter distributor. These gages are made with BALANCED ACTION thoroughness. Catalog on request.

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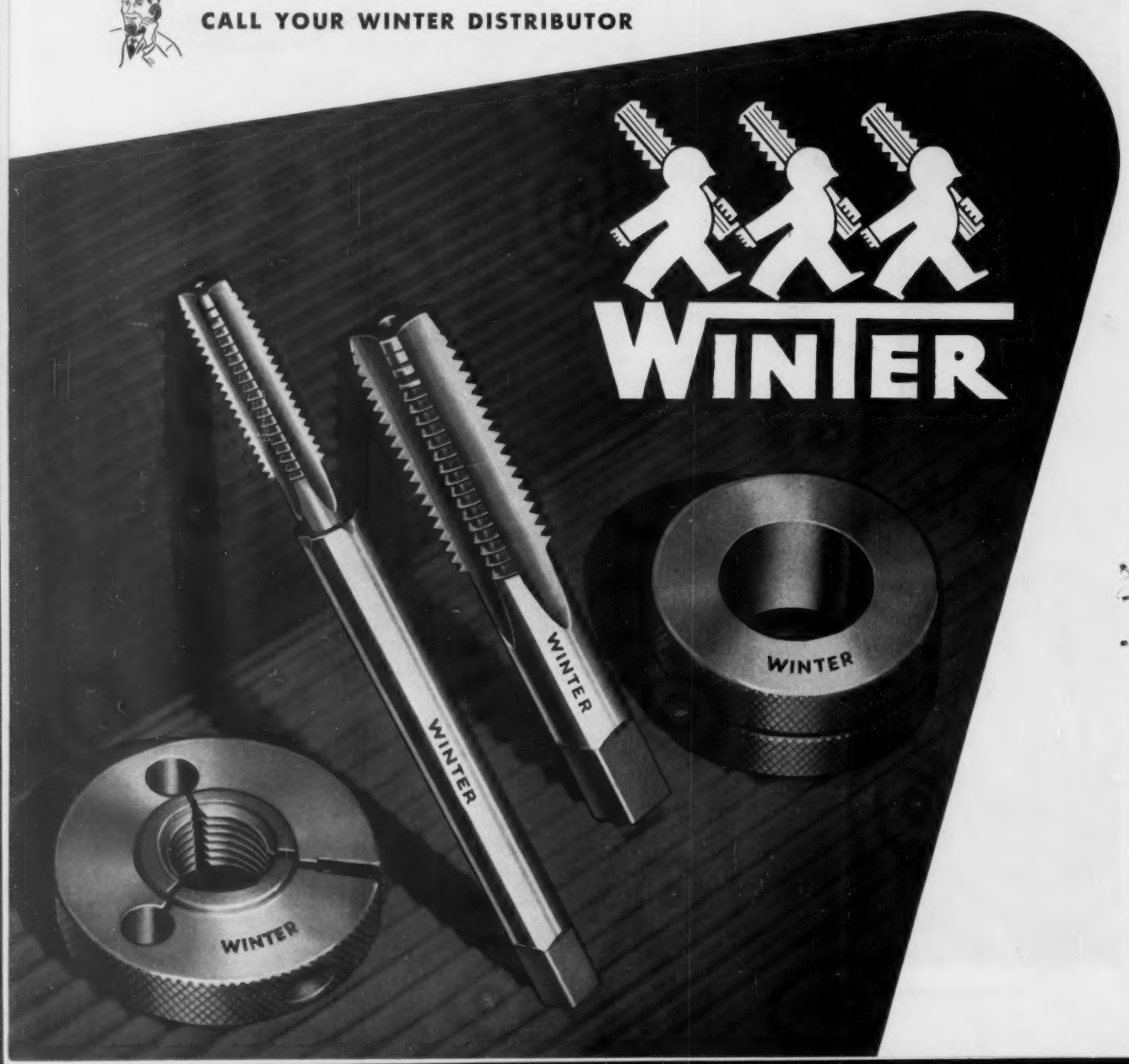

The Cutting Tools That Give You The Edge

You depend on *the cutting edge of the tool* to give you long hours of dependable service. Nationals hold their cutting edges. They keep your grinding room costs at a minimum too.

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

Now Available With
CARBIDE TIPS:

National Twist Drills, Reamers, End Mills, Milling Cutters, Counterbores.

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Twist Drills • Reamers • Counterbores • Milling Cutters • End Mills • Hobs • Carbide Tipped and Special Tools

Presenting...

the NEW

tri-D®
MILLING HEAD
KEARNEY & TRECKER
MILWAUKEE

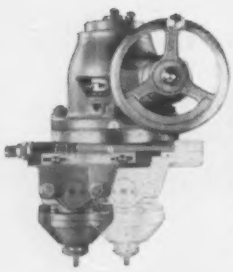
adaptable to almost all horizontal and some vertical milling machines . . . regardless of make

The new TRI-D Milling Head is the latest addition to Kearney & Trecker's outstanding Rotary Head milling family. TRI-D is designed for quick, easy mounting on practically all horizontal and some vertical milling machines.

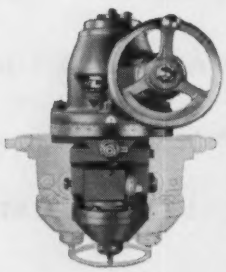
The TRI-D Milling Head can produce almost any geometric shape in metal employing straight lines, radii or angles — all in a single set-up. Power is transmitted to the spindle through a heavy-duty flexible shaft driven by the machine spindle or a separate motor equipped with variable speed pulleys.

TRI-D's matchless technical perfection brings to metal cutting an insured investment equalled by no other single element of production. Find out how you can increase production and cut milling costs with this new milling head. Your Kearney & Trecker representative will be pleased to give you all the details. Contact him today, or write Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

Only tri-D has all 3 . . .



1. LATERAL ADJUSTMENT of the cross-slide permits off-setting the spindle up to 2½". A large dial, graduated in thousandths, is mounted on the cross-slide screw. Precision-ground screw assures the ultimate in accuracy and long life. A friction-lock secures cross-slide position.



2. ROTARY MOVEMENT of the head through a complete circle, or any specific part, is easily accomplished by turning handwheel in either direction. Combined with lateral adjustment of the cross-slide, this rotary movement permits milling of circles up to 5" in diameter.

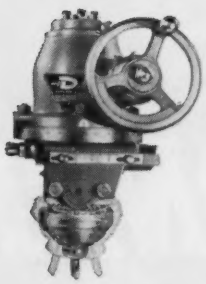
Pat. No. 2286821
other Pat. Pend.

THE MACHINE TOOL SHOW
CHICAGO, ILL.

BOOTH NO. 508

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS



3. ANGULAR ADJUSTMENT of cutter, an exclusive feature, is the swivel block which permits positioning of the cutter at any angle in the vertical plane, up to 15°, either side of center. Easy-to-read graduations make setting to a precise angle a very simple operation.

Kearney & Trecker Corporation
6784 W. National Avenue
Milwaukee 14, Wisconsin

Please send me catalog No. TD-10 with details on new TRI-D Milling Head.

Name.....

Title.....

Company.....

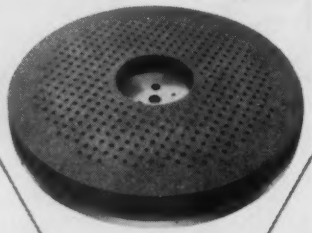
Address.....

City.....Zone.....State.....

6 Cost Cutting Abrasive Ideas to Cut Your Grinding Costs

Combined Smooth-Deep-Corrugated Wire-Lokt Disc

Smooth section for initial shear cut, corrugated for fast, cool stock removal.

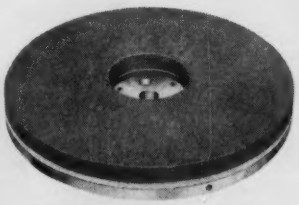


Round Center Wire-Lokt Cylinder Wheels

Gardner adapters permit fast, accurate mounting and eliminate wasteful stubs.

Smooth Surface Wire-Lokt Disc

For general purpose grinding on soft steel and cast iron.



Square Center Wire-Lokt Wheel Cylinders

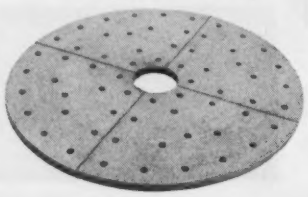
Patented construction has four shearing edges for heavy stock removal.

Deep-Corrugated Wire-Lokt Disc

For fast, cool cutting on large areas, thin parts or tough metals.

Sectional Wire-Lokt Disc

Large diameter discs in separate sections for easy handling and mounting.



- Wire-Lokt Safety Construction
- Tailored to Your Grinding Needs
- Bonds for Wet or Dry Grinding
- For All Standard Types of Mounting
- Nation-wide Abrasive Engineering Service

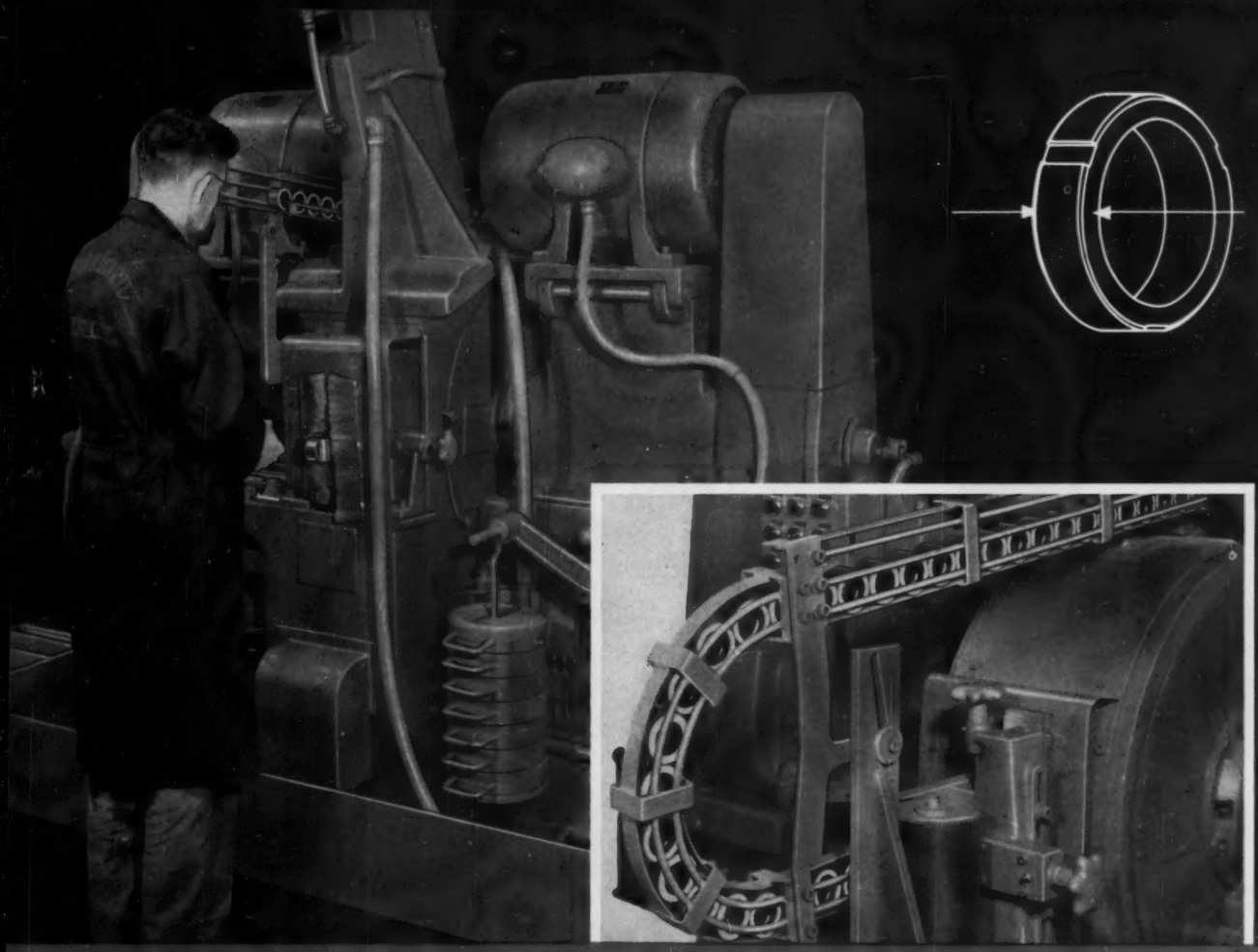
118AS

Your local Gardner Abrasive Man is ready to help you. Write and we will have him call at your plant.

GARDNER

abrasive discs

BELOIT, WISCONSIN, U.S.A.



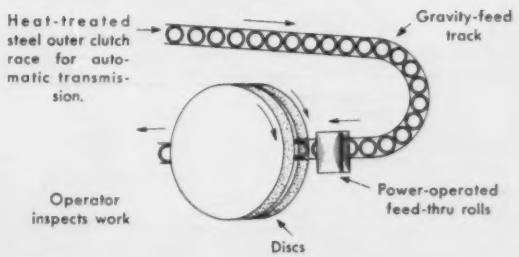
Grinds 3600 Clutch Race Faces per Hour

Job Data

MACHINE	Gardner No. 125-26" Double Spindle Grinder.
PRODUCTION	1800 per hour, both faces.
STOCK REMOVAL	.030" overall.
TOLERANCES	.0002"-.003" for parallelism; .0005" for uniformity.
ABRASIVES	2 Gardner Yellow-Rim WIRE-LOKT DISCS.®

144M

Production and accuracy increased by grinding TWO parallel faces in ONE operation



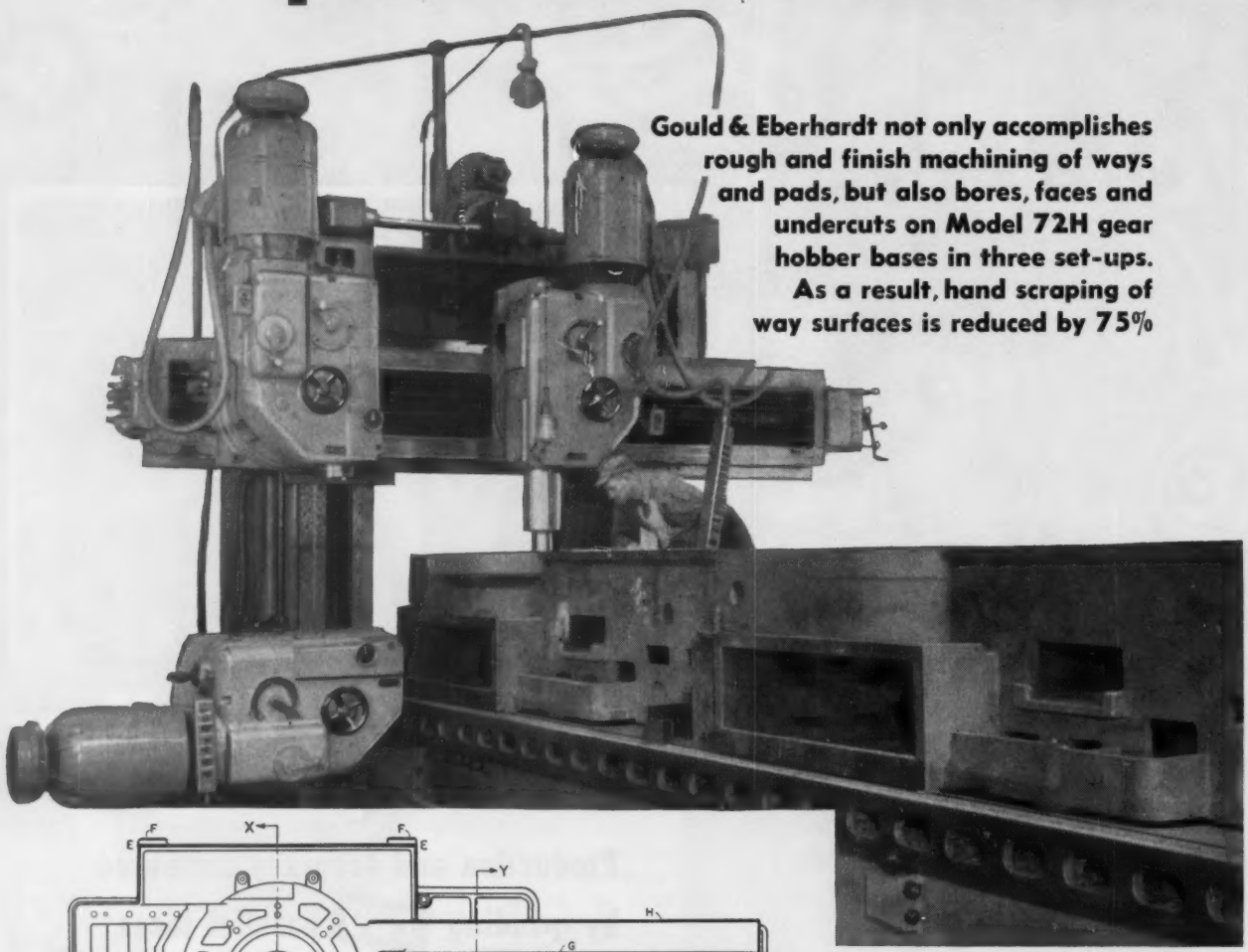
GARDNER

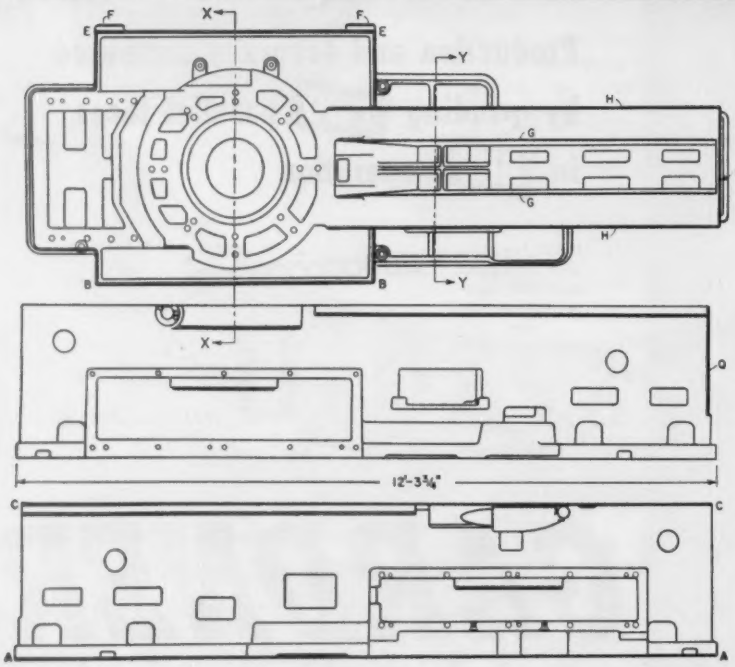
precision disc grinders

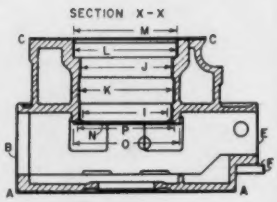
BELOIT, WISCONSIN, U.S.A.

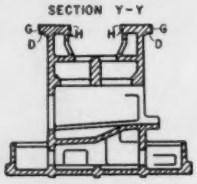
How Giddings & Lewis performs 21 successive

Gould & Eberhardt not only accomplishes rough and finish machining of ways and pads, but also bores, faces and undercuts on Model 72H gear hobber bases in three set-ups. As a result, hand scraping of way surfaces is reduced by 75%









Hypro Planer-Miller operations in three set-ups!

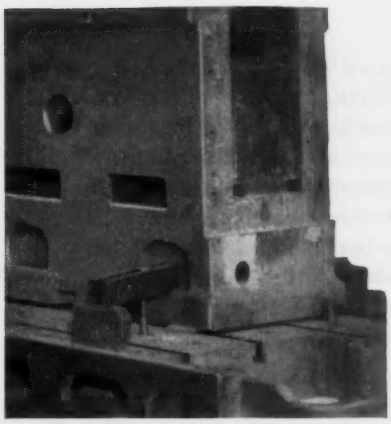
Do you want to reduce repositioning of workpieces and increase the number of machining operations per set-up? Then look at all the work accomplished on a G&L Hypro Planer-Miller at Gould & Eberhardt, Irvington, N. J.

Two 12' 3¾" Meehanite gear hobber bases are clamped end-to-end on the 30' worktable. A total of 21 successive rough, semi-finish and finish cuts is made on each of the bases utilizing all four heads, sometimes simultaneously, with only three shiftings of the castings. Machining is done on ways, pads and other flat surfaces, as well as bores, faces and undercuts in the hobber spindle hole. The procedure outlined below reduces hand scraping by 75%.

When you want to perform a series of machining operations simultaneously, you can depend on a G&L Hypro Planer-Miller to do the job efficiently and economically. They are built with 30" to 144" width of the table and in table lengths, and in horsepower ranges to meet specific requirements. Equipped with electronically controlled drive, to the table, rail and milling heads, it permits the operator to make independent selections of motions to any unit . . . thus permitting the operator to machine a variety of materials, shapes and contours to unusual accuracy such as cannot be accomplished on conventional planer-milling machines.

For complete information, see your G&L representative today, or write direct to factory.

Builders of the world's finest heavy-duty Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

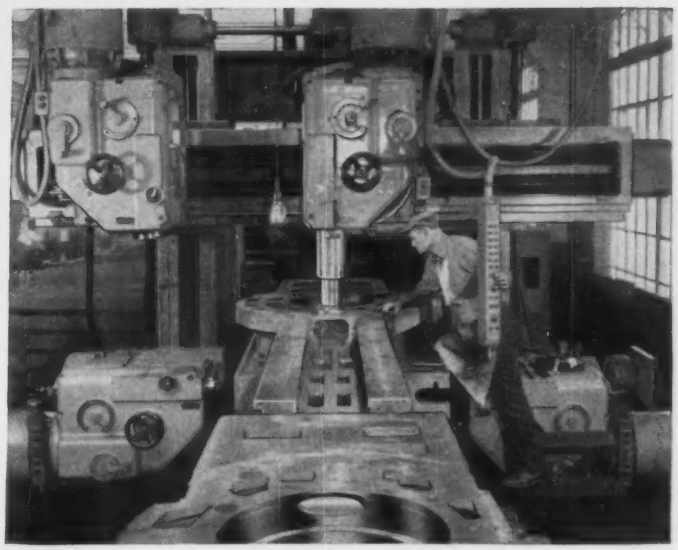


Machining Sequence

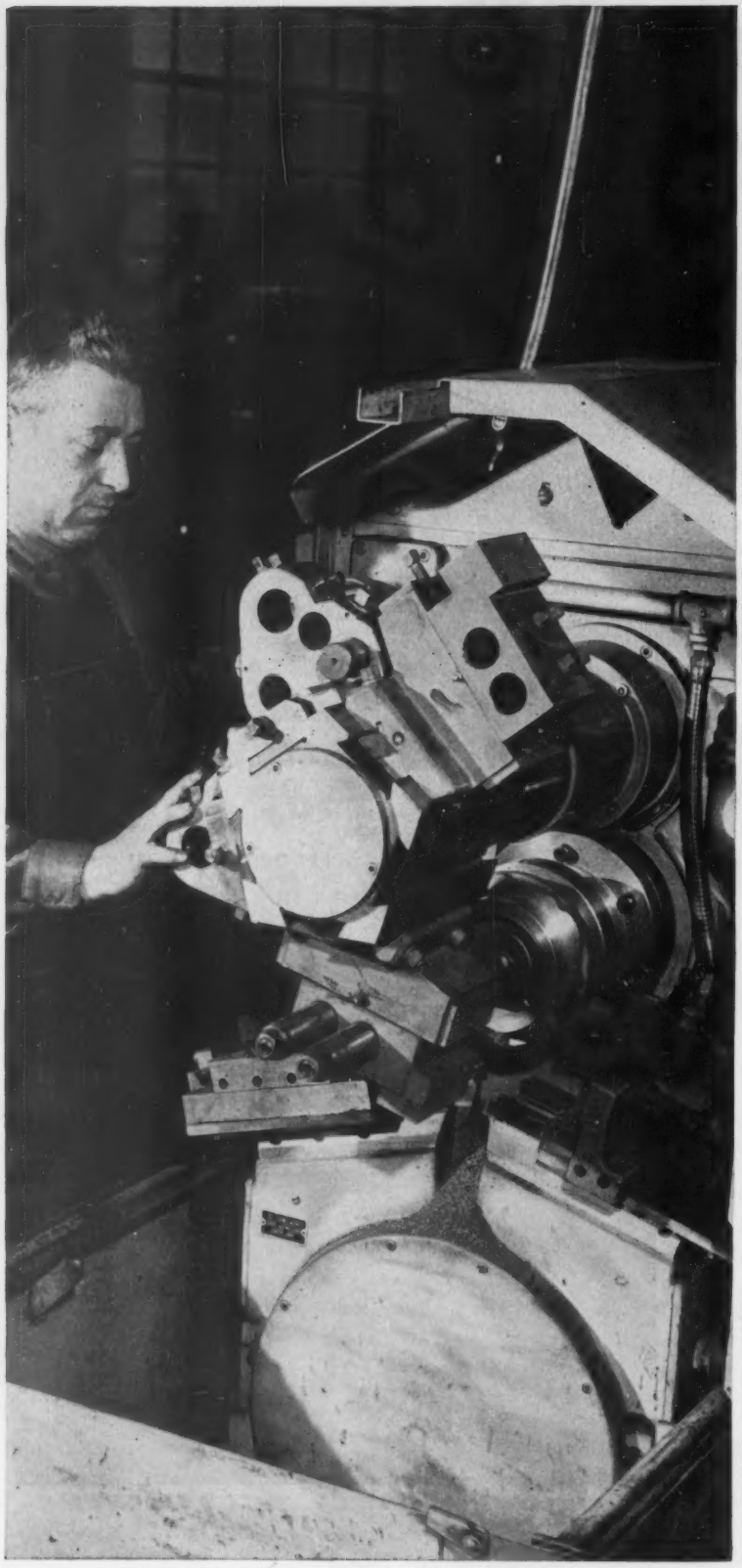
Rough and finish mill bottom "A" and cover surface "B".
Turn casting over resting on bottom surface.
Rough and semi-finish mill "C", underside of ways "D", index-worm bearing surface "E" and two lugs "F".
Rough and finish mill pads on side and between the ways, and semi-finish the edges on the outside "G", and inside "H".
Rough bore 20.000" dia. "I", and 20.005" dia. "J".
Rough and finish bore 20 1/16" dia. "K", and 22 15/32" dia. "L".
Rough and finish bore 22.500" dia. "M".
Face boss "N", recess 23" dia. "O", and counterbore 20¼" dia. "P".
Mill end for gear case "Q".
All drilling operations intervene.
Base is then set up on the G&L Planer-Miller for finishing.
Finish mill top "C", and underside of ways "D".
Finish mill index worm bearing surfaces "E" and two lugs "F".
Finish bore 20.005" dia. "J", and 20.000" dia. "I".

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN



Work spindle hole is bored after completion of milling the ways. Several diameters are rough and finish bored, including undercuts on inner diameter. The faces and recesses in the boss at the bottom are turned, using a special tool holder. Precision machining ways and spindle bore on one set-up is principal reason these finished surfaces require minimum scraping to produce an excellent bearing.



When Precision was the Pay-Off!

HALEY MACHINE COMPANY, Springfield, Ohio, installed a Warner & Swasey 1 AC Single Spindle Automatic Chucking Machine to turn vital, high-precision hydraulic pump parts for U.S. Army tanks. The job called for extreme accuracy, because these pumps are filled under pressure with an exceptionally light oil.

To avoid leakage these extremely close tolerances had to be held—40 to 63 micro-inch finish on surface finishes, .002″ on forming, .0008″ to .001″ on turning, and .001″ in concentricity. Maintaining such accuracy with previous methods was difficult—scrap loss was too high. Production had to be speeded up.

Boosts Production, Cuts Scrap Loss

The new Warner & Swasey took the function of holding these close tolerances out of the operator's hands—substituting the automatic operation of this high-precision machine for

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

the job. Production was doubled—in some cases tripled! Scrap loss was reduced 12 to 15%.

This type of consistent accuracy is just not possible by manual methods due to the human error of even the best machinists. It is even unusual for an automatic. But the Warner & Swasey 1 AC has the rigidity, the *built-in* accuracy, plus the ability to repeat accurate settings to handle the *most difficult* jobs!

But extreme accuracy is just one important advantage offered by Warner & Swasey Single Spindle Automatics. Both the 1 AC and 2 AC are *real producers!* As at Haley Machine Company, their fast, automatic operation has paid off in plant after plant—where production had to be increased in existing floor space, or where production "bottlenecks" had to be broken to meet production schedules.

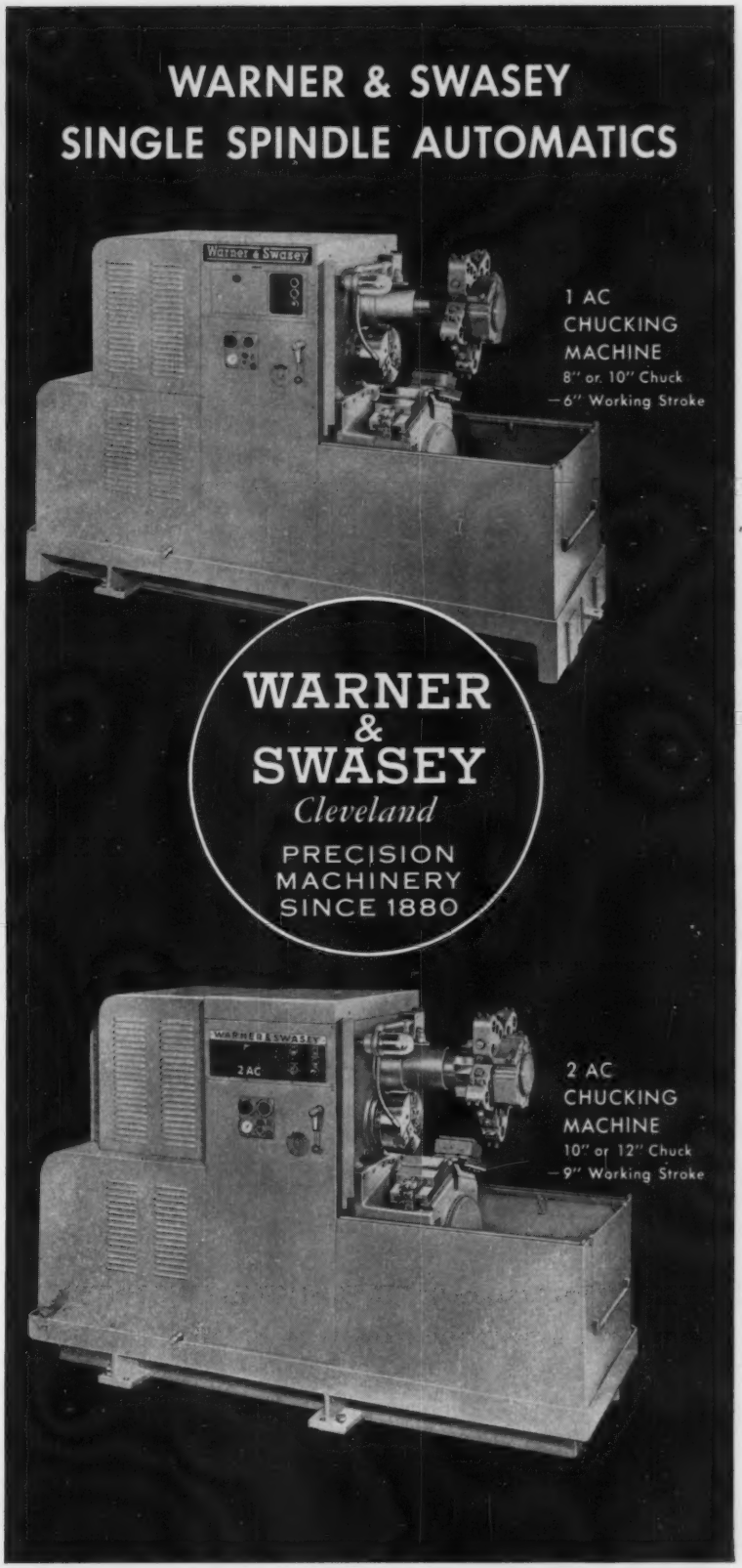
Quick Setup Provides Flexibility

The fast, easy setup of these machines extends the advantages of automatic operation to *small-lot* work as well as medium and longer run jobs. Each has a pentagonal control drum equipped with easily adjustable trips for selection of feeds, spindle speeds, length of cutting stroke, and skip indexing. No cam changes are needed.

Operators like these Automatics' ease of operation—and accuracy and production can be maintained by operators with less skill than that required for hand-operated machines.

See Your Turning Specialist

Certain jobs in your plant can undoubtedly be machined better, faster, and more profitably with Warner & Swasey Single Spindle Automatics. Call in your *turning specialist*—your Warner & Swasey Field Representative—and have him show you how these machines can cut costs and *build profits* for you!



SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

For more information on products advertised, use Inquiry Card, page 257

The Newest Member of a Distinguished Family . . .

Cincinnati No. 1 Cutter and Tool Grinder

BRIEF SPECS.

Swing over table . . . . 8" diam.
Max. length of work:
between tailstocks . . . 15"
between tailstock and workhead . . . . . 11½"
Taper hole in workhead spindle:
one end . . . . . No. 50 Std.
other end . . . . . No. 12 B&S

CINCINNATI

New CINCINNATI No. 1 Cutter and Tool Grinder. Complete data in catalog No. M-1852.

The family history of CINCINNATI cutter grinders dates back to 1889, and includes many well-known contributors to low metal-working costs. Today, the family comprises the hard working No. 2, the Monoset, Contour, Projecto-Form, and the most recent addition, No. 1. ¶New CINCINNATI No. 1 Cutter and Tool Grinders are by far the most versatile in their classification. The wheelhead swivels 360° on an eccentric pivot to position the wheel as desired, including over the table . . . the wheelhead motor is built-in, and direction of rotation reversible . . . sealed wheelhead column and curtains for table ways minimize wear . . . anti-friction ways promote smooth traverse. ¶There are many other reasons why CINCINNATI No. 1 Cutter and Tool Grinders are your best buy for sharpening small- to medium-sized cutters. Want to know more? Write for catalog No. M-1852.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

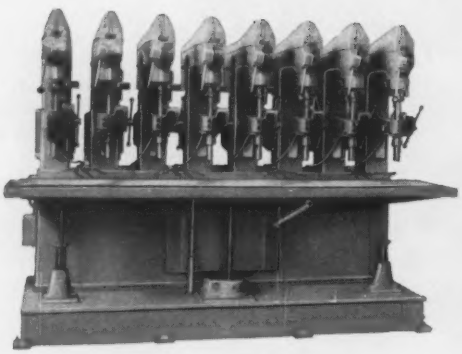
CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES

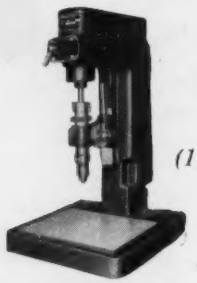
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Whatever your light and medium duty drilling needs, it's a sure bet that the machine

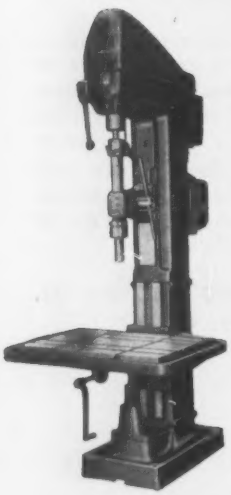
Avey has the right one



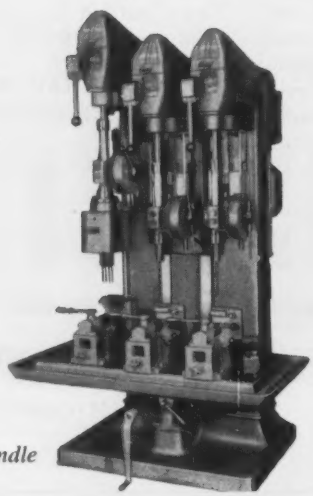
(7) Super 8 spindle



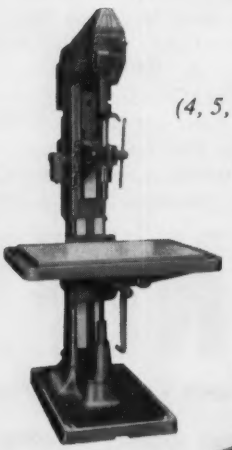
(1) Bench type

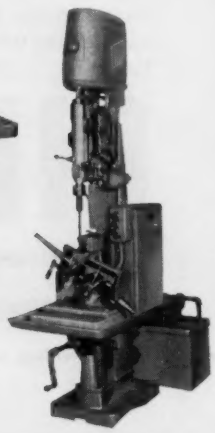


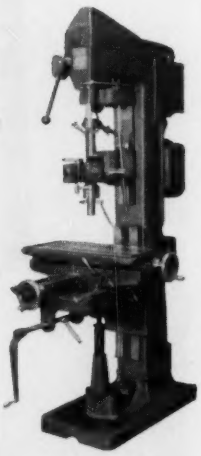
(2) Column type



(3) Multi-spindle







(4, 5, 6) Tool room drills

Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures—would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

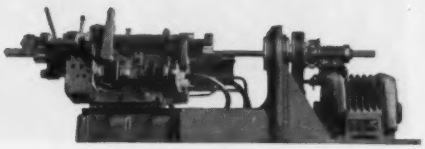
(Figures 1 through 6) Standard Drilling and Tapping Machines. Capacities in cast iron from very small numbered drills to 1½″; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

(4, 5, and 6) Avey tool room drills, built in No. 2 and No. 3 BMA-6 sizes. Large table 34″ x 25″; round table 18″ diameter; compound table 25″ x 12″.

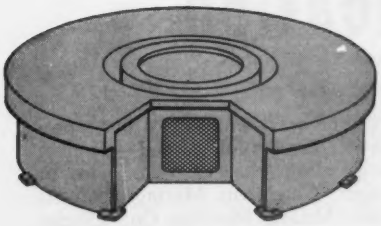
(7) Super 8 Spindle Drilling and Tapping Machine. No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

for Avey makes them all

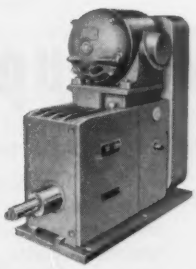
Avey



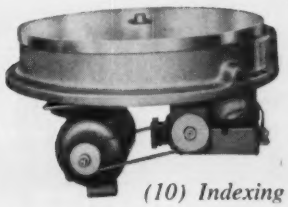
(9) Avey-draulic



(11) Standard base



(8) Cam feed unit



(10) Indexing table

(8) Automatic Cam Feed Units. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½″; No. 2, 1″. Mount at any angle. Fully or semi-automatic. Self-contained, tamper-proof.

(9) Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12″ up to 30″. Avey's patented Torque-matic control optional.

(10) Automatic index tables. Rapid, accurate indexing to .001″. Even or uneven index patterns obtainable. 16″ to 48″ diameter. All adaptable to Avey standard bases.

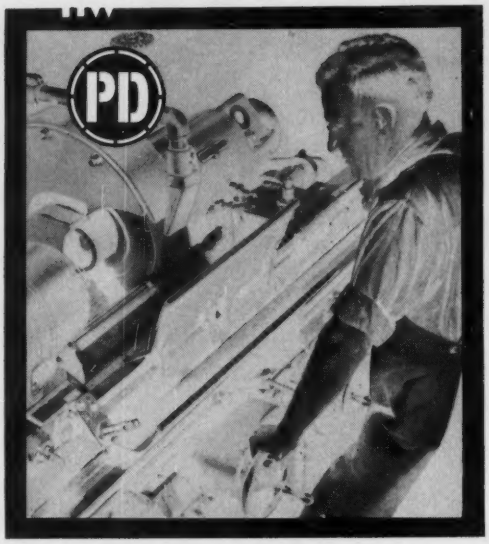
(11) Steel Bases. One of Avey's standard line of fabricated bases. Stress relieved, sandblasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

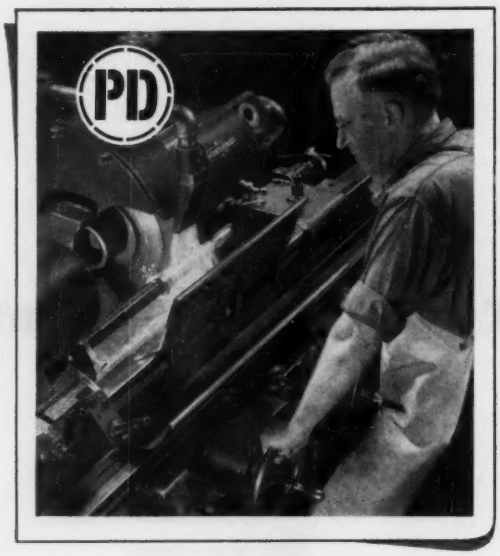
drilling, tapping, production machines

The most talked about development in years...

JUST AS A NEGATIVE guarantees you an exact duplication of a photograph each and every time, you are always assured a . . .



. . . POSITIVE DUPLICATION of an original grinding wheel each and every time through the CINCINNATI (PD) Manufacturing Process.



NOW!

Cincinnati Grinding Wheels offer

PD Positive Duplication

No wonder the good news about Positive Duplication is causing so much excitement. For (PD) is an outstanding development in precision manufacturing and quality control that can *save you money* . . . and *increase your production.*

Through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

Investigate! Let us prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO

NOW!

CIMCOOL Cutting Fluids cover ~~85%~~ 100% of all metal cutting jobs!

Here indeed is welcome news for industry, which has depended upon the five Cimcool° products to cover 85% of metal cutting operations. *Now,* through the addition of *four new products*—CIMCUT BASE ADDITIVE, CIMCOOL "CI", CIMCOOL MACHINE CLEANER, and CIMCOOL BACTERICIDE—the Cimcool family of products will serve industry *one hundred per cent!*

Now, you can have one source of supply for *all* your cutting fluids—fluids that will not only *lower costs . . . but do a better job.* Meet the entire family of *nine* Cimcool products, each one uniquely designed to serve a purpose in industry—each one developed in the laboratory and proved on the job:

CIMCOOL STANDARD CONCENTRATE—The famous pink cutting fluid which still covers 85% of all metal cutting jobs.

CIMCOOL S-2 CONCENTRATE—For heavy duty use.

CIMCOOL WATER CONDITIONER—For increased rust control.

CIMCOOL TAPPING COMPOUND—The magic compound that increases tap life amazingly.

CIMCOOL TRANSPARENT GRINDING FLUID—For superior rust control at high dilutions.

CIMCUT BASE ADDITIVE—For jobs requiring an oil-base coolant.

CIMCOOL "CI"—The cutting fluid for cast iron with exceptional rust control properties.

CIMCOOL MACHINE CLEANER—The 2-phase non-corrosive cleaner that cuts grit, dirt, slime and oil.

CIMCOOL BACTERICIDE—The most effective agent yet developed to overcome rancidity.

Our representatives will be happy to give you full details about these nine great products now serving industry 100% . . . and to prove to you, through actual demonstration, that Cimcool products *lower costs—and do a better job.*

Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

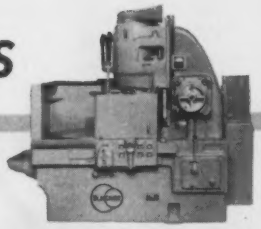
°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL
Cutting Fluids

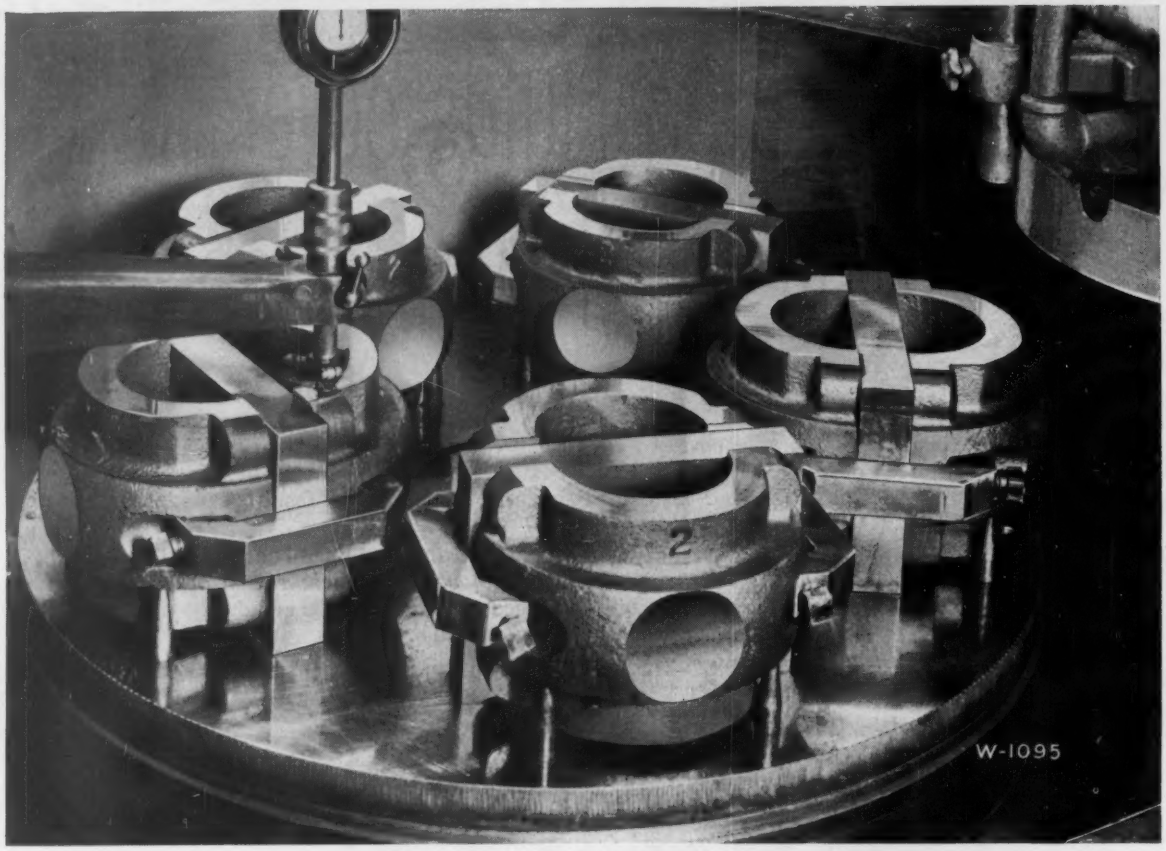
100% for ~~85%~~ of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

IT PAYS



TO PUT IT ON A BLANCHARD



The first operation on these cast steel (1504) bearings is to Blanchard grind the parting line to establish locating surfaces.

Then, a No. 18 Blanchard Surface Grinder (shown above), with 36" magnetic chuck, rough grinds the end faces of all five sets in 17 minutes—at an abrasive cost of only 2¢ per piece! This operation provides locating surfaces for additional machining. By using the correct Blanchard wheel* and proper rate of down feed, the wheel dresses itself and removes three cubic inches of cast steel per minute.

The final Blanchard operations include finish grinding both end faces—removing .015" of stock from each end, flat and parallel to ±.001". Each surface is ground in 17 seconds, fourteen pieces to a load, located directly on the magnetic chuck.

**Blanchard Grinders perform best with Blanchard Wheels!*

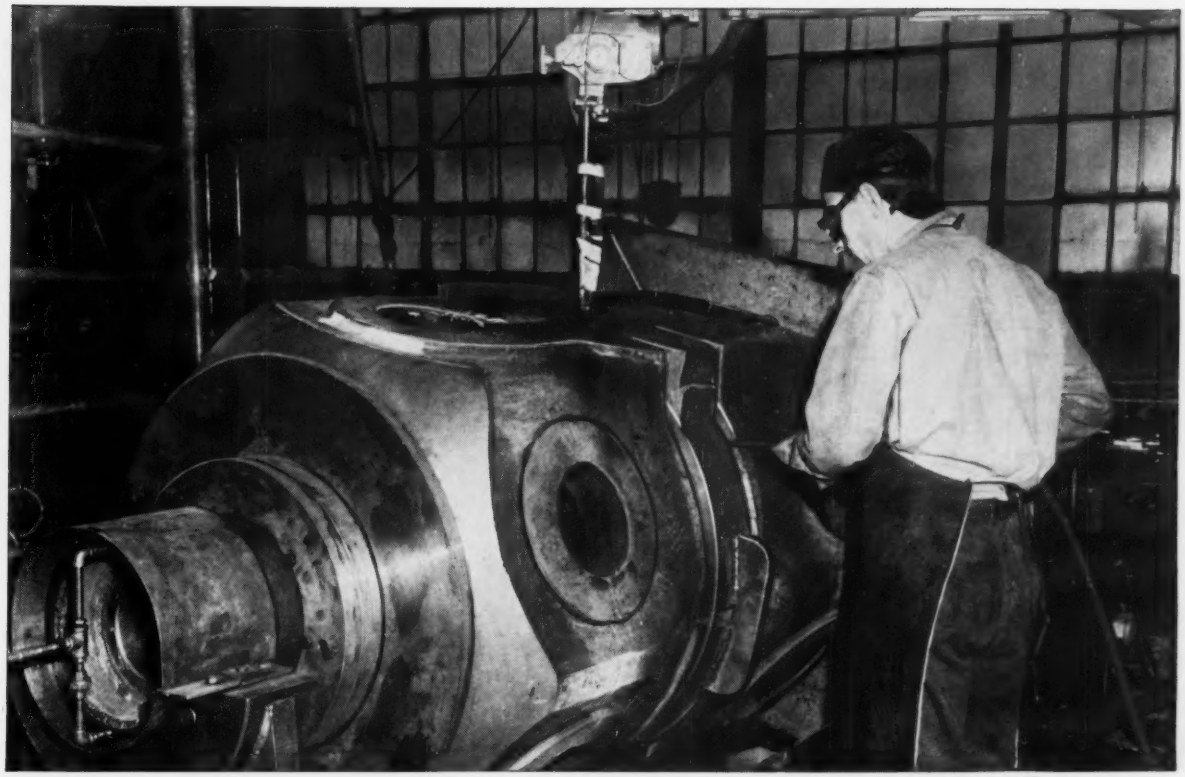
Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

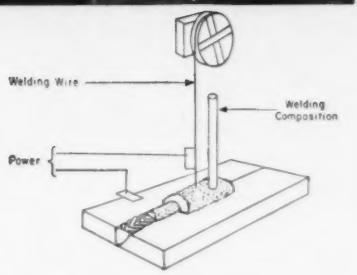
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

For more information on products advertised, use Inquiry Card, page 257



UNIONMELT Welding Solves "Impossible" Casting Job . . .



UNIONMELT welding solved the problem when a manufacturer was unable to make one-piece castings of compressor cylinders used in gas line pumping stations—other welding methods proved too slow and costly . . . UNIONMELT welding cuts 40 hours in production time, and produces high-quality welds that easily withstand pressure of 750 lb. per sq. inch.

The 42-in. diameter cylinder is cast in two halves, and has an internal piston bore with surrounding suction and exhaust chambers . . . The 2½-in. thick piston walls and 3-in. thick outer walls of each half are aligned and UNIONMELT welded.

Like many other products throughout industry, these cylinders are being fabricated faster and more economically than ever before, because UNIONMELT welding offers:

- Higher welding currents than other welding processes . . . Up to 4,000 amperes . . . Joins metal of any thickness.
- Greater economy—½ to ⅔ less welding wire . . . Also uses larger-diameter, less-expensive wire.
- Use of any power supply—a.c., d.c., or constant potential . . . With c.p., no control is necessary to maintain constant arc voltage—welding is fast and more easily controlled.

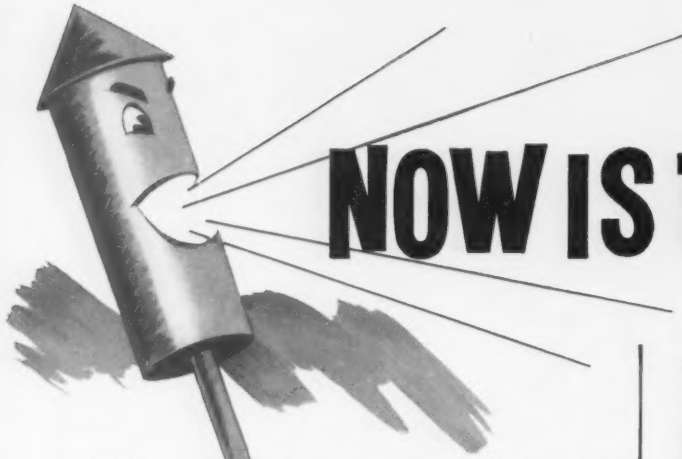
Start saving now—call your local LINDE representative for more information and ask for Form 7942, "Modern Methods of Joining Metals."

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

For more information on products advertised, use Inquiry Card, page 257



NOW IS THE TIME . . .

TO REDUCE YOUR MANUFACTURING COSTS WITH A

CUTMASTER VERTICAL TURRET LATHE Model 75

This revolutionary new design of vertical turret lathe has exclusive features never before offered on machines of this type . . . takes full advantage of the latest improvements in cutting tools and methods . . . truly the machine with a "built-in" future.

PENDANT CONTROL . . .
provides maximum machine control from a movable pendant station. Start and stop spindle; selection of speeds, feeds and directional movement of all heads in feed or traverse are quickly and easily accomplished from the Pendant. Interlocks and a stopall stick provide safety for both operator and machine.

SCREW FEED . . .
is provided for vertical and horizontal motion of all heads to assure fine, smooth finishes with greater accuracy.

POWER INDEXED MAIN TURRET . . .
(Optional) Five sided turret for "run of the mill" jobs. Four sided turret for production jobs.

SEVENTY FIFTH
1880 BULLARD 1955
ANNIVERSARY

PLAN TO SEE OUR EXHIBIT AT . . . .

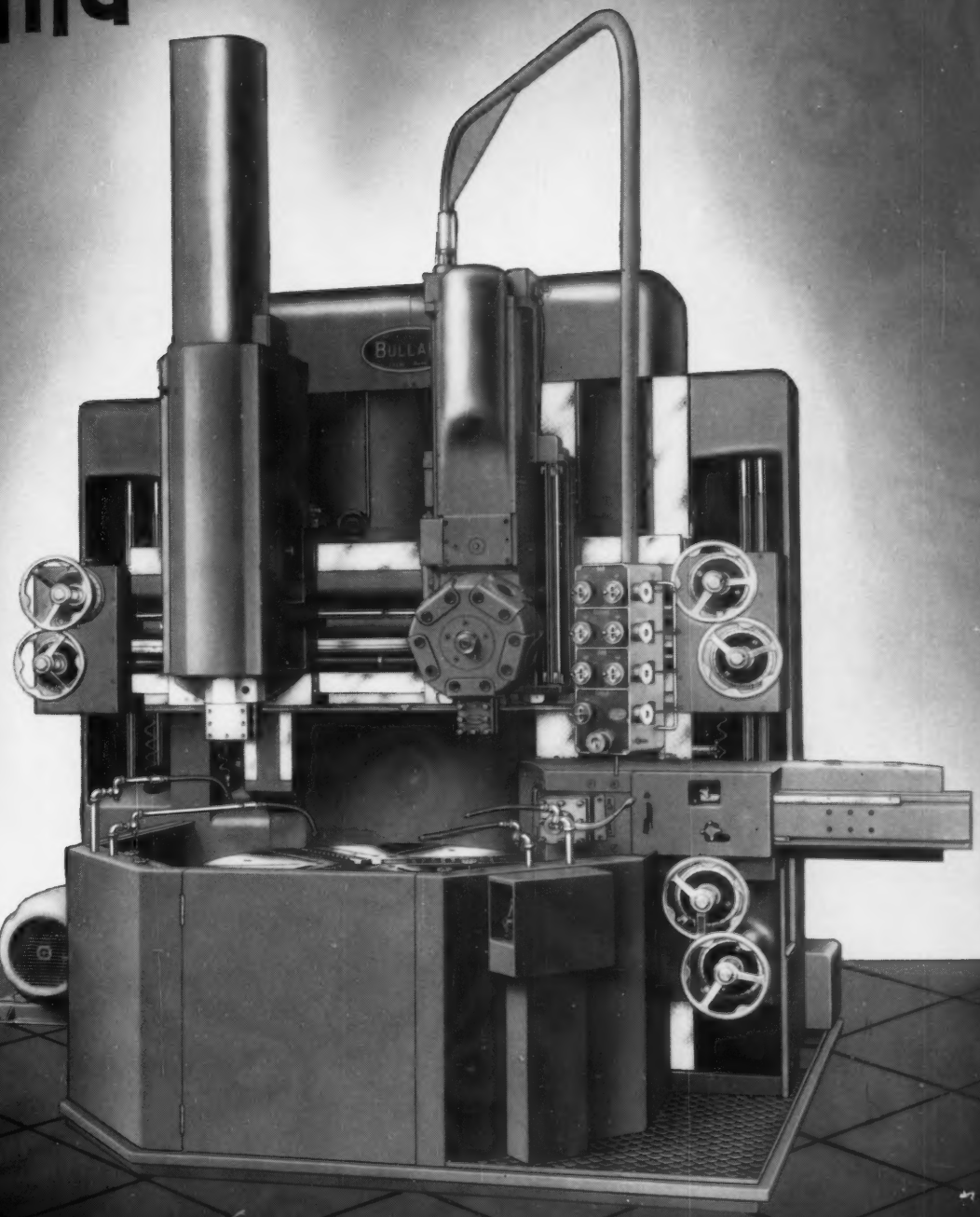
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

M 50 T

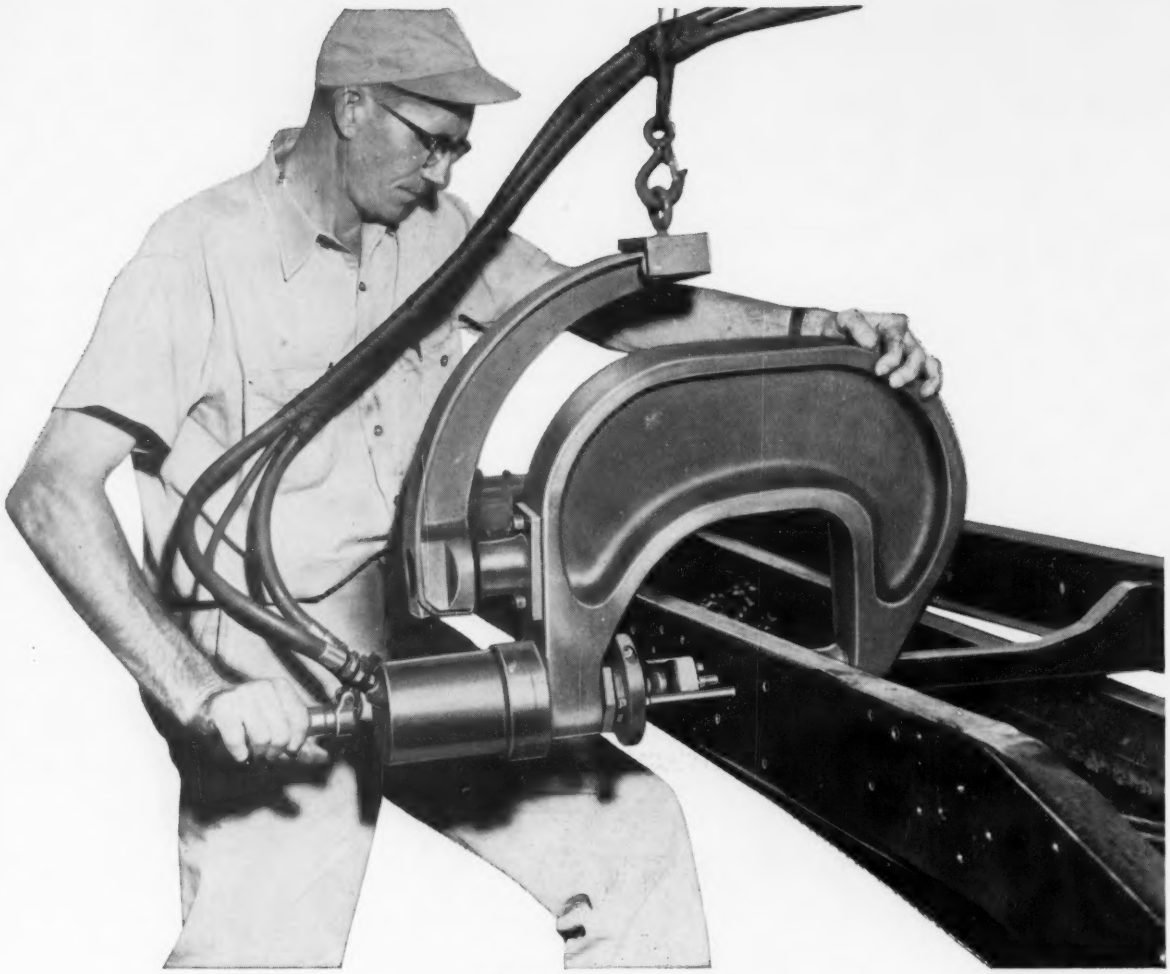
WE INVITE YOUR INQUIRIES—CALL OR WRITE
YOUR NEAREST BULLARD SALES OFFICE, DISTRIBUTOR OR

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

. . . and here is the way !



AVAILABLE IN 26, 36, 46, 56, 66 AND 76 INCH SIZES



delivers a

Sunday punch

every 3 seconds

Operators don't have to be "muscle men" to handle a CP 25-ton Hydraulic Punch. See how just a flick of a finger punches a 15/32" hole through this heavy steel truck frame. Light weight in proportion to its tremendous punching capacity, the CP Hydraulic Punch can be operated by one man for an entire shift. Its speed and accuracy increase holes per man hour . . . afford cleaner, completely uniform holes. Punch and die maintenance and sharpening costs are considerably lower per hole than in mechanical punch or twist drill methods. And CP Hydraulic Punches are ideal when teamed up with CP Portable and Stationary Cold Riveters.

Write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

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YOU DON'T CUT ANY FASTER...

you just finish the job sooner

and at lower cost per piece

Most *good* modern machines will cut as fast as today's carbide and high-speed tools will take it, so your actual time per cut will be the same, regardless of the machine you use. But when you put jobs like this on an

Acme-Gridley Fully Automatic Turret Lathe

you *finish them faster* because non-cutting (idle) time is accelerated and controlled. The complete machining cycle is entirely automatic and predetermined—to give the minimum time per piece, on *every piece*. Machining is done at the surface speed best suited for required finish and tolerance because each toolslide is independently cammed and selective spindle speeds are automatically controlled.

Ask us to show you how *automatically controlled cycle** can turn non-productive "idle" time into savings like this—on your jobs.

JOB FACTS

- **PACKING GLAND NUT from 4¼" round 1112 C.D. Steel.**
- **12 OPERATIONS (with 9 tools) including threading and tapping.**
- **FORMER METHOD produced 409 pieces in 192 hours on hand operated machine.**
- **ON MODEL M ACME-GRIDLEY—325 pieces in 48 hours.**
- **SAVINGS—7 to 2 production increase at better than 3 to 1 savings in cost per piece.**

Automatically controlled cycle
IS **STANDARD** ON ALL ACME-GRIDLEYS.

Send for Catalogs M-50A and MC-53

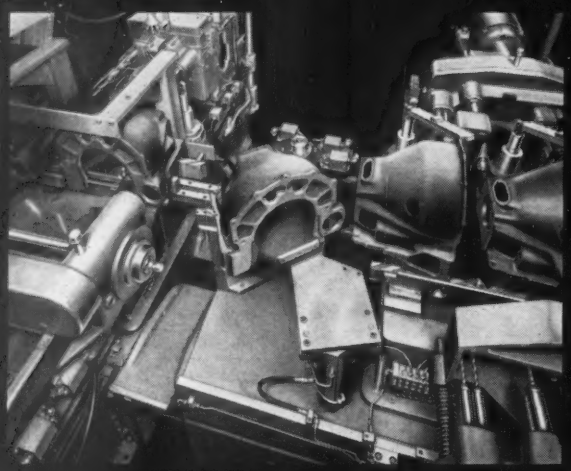
OUR JOB: to provide the *Right Machine* for **YOUR JOB**

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

THE NATIONAL ACME COMPANY

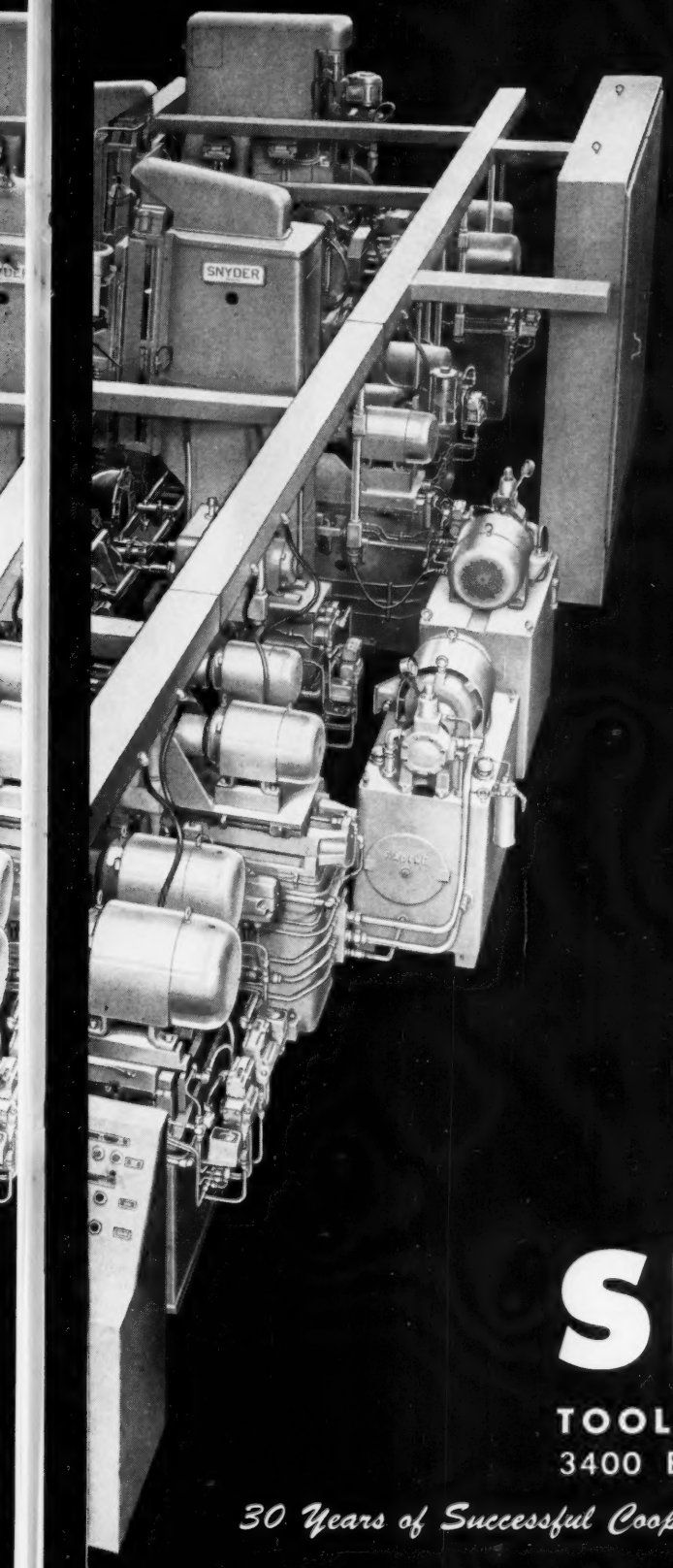
179 EAST 131st STREET • CLEVELAND 8, OHIO

SNYDER–AUTOMATION



At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

LEADER FOR 30 YEARS



Presents

SNYDER SPECIAL

22-STATION automatic transfer machine for processing cast iron clutch housings; which drills, rough and finish bores, mills, saws, taps, spot-faces, counterbores and chamfers, performing a total of 110 operations on various surfaces or holes of various dimensions. Production, 124 cycles an hour at 80% efficiency.

UNUSUAL FEATURES: At Station 1, a 2" breather hole is trepanned from solid metal and finish bored with one tool. At Stations 8 and 9, a section of transfer rails cam-linked to milling units, drops to bring work piece into line with cutters. At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

SNYDER

TOOL & ENGINEERING COMPANY

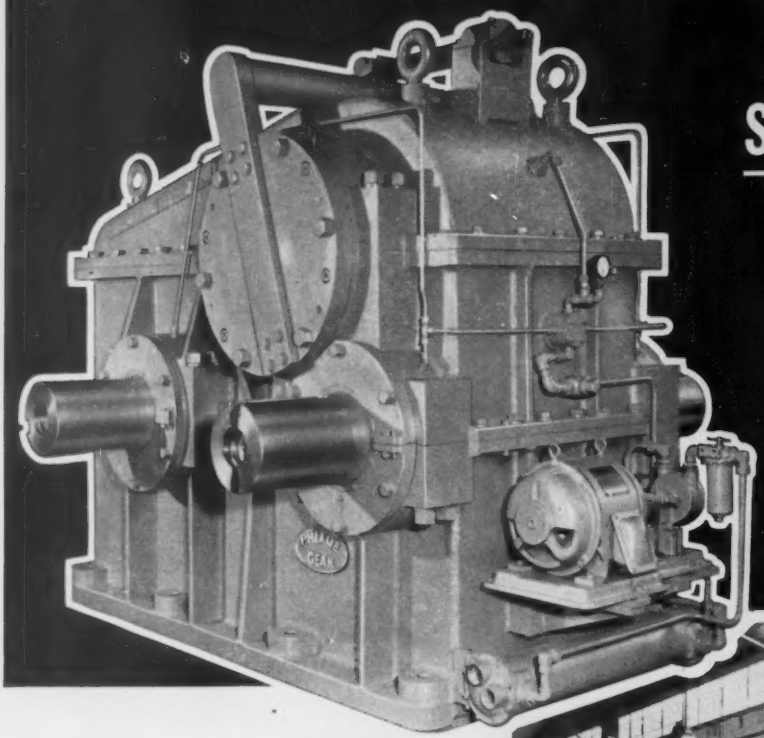
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

30 Years of Successful Cooperation with Leading American Industries

A SPECIAL REDUCER . . .

on a very SPECIAL JOB

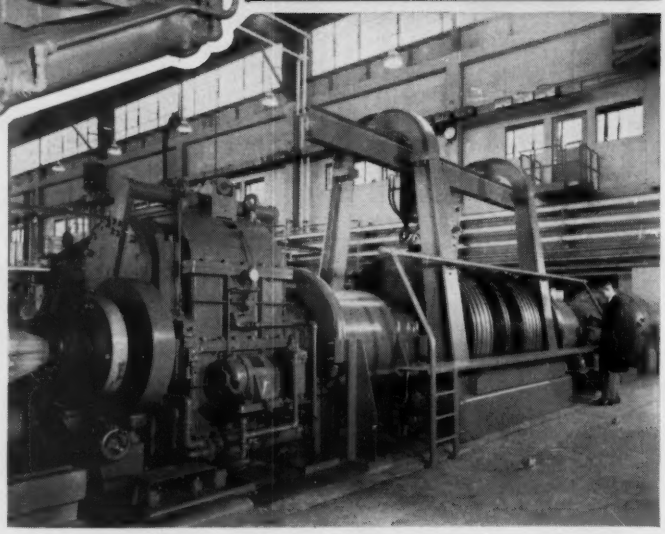
JOHNS-MANVILLE JM PRODUCTS



We are proud that the Johns-Manville Research Center at Manville, New Jersey, called upon us to build the huge, 10 ton specially designed gear-reduction Unit (shown above) to drive the world's largest and most versatile inertia type Dynamometer.

This Philadelphia Unit is driven by a triple speed induction motor set and clutch, and is rated 5,800 HP at 300 rpm. Gears and pinions are double opposed helicals manufactured from alloy steel forgings.

Over the years, many special Speed Reducers and Increasers for various industrial and governmental applications have been designed and built by "Phillie Gear." If you have an unusual or special drive problem . . . consult "Phillie Gear" Engineers and be assured of complete satisfaction.



Inertia-type dynamometer for testing friction materials for aircraft, industrial equipment, railroad, truck, and bus brake assemblies. The components are arranged in tandem. At the far right are the triple-speed induction motor and clutch mechanisms. Following, in order, are the inertia wheel disks, the Philadelphia reduction unit, and the torque stand to which the brake assembly at the left is attached. Complete, the dynamometer weighs 200 tons.

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
Virginia Gear & Machine Corp., Lynchburg, Va.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

ESTABLISHED 1892

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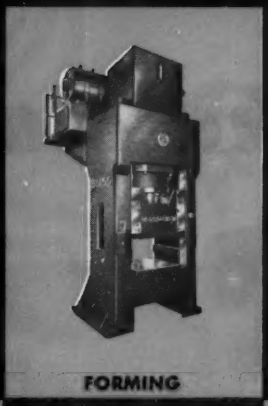
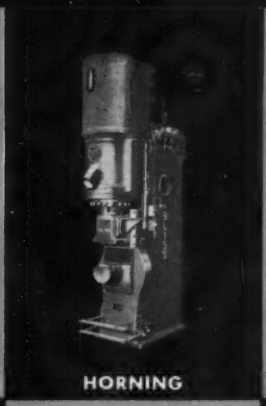
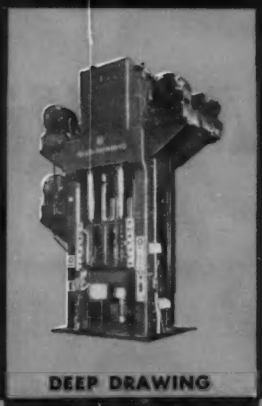
COLD EXTRUSION



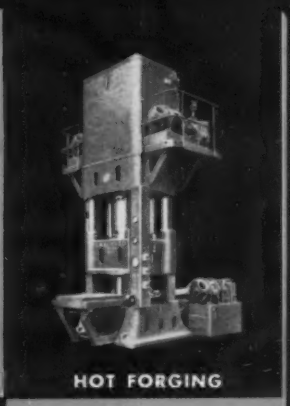
FORMING



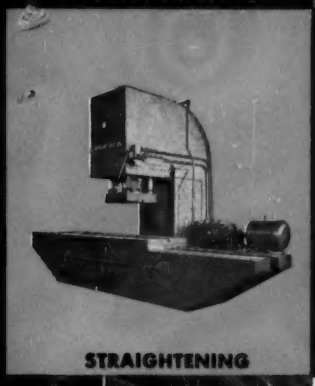
HORNING



DEEP DRAWING

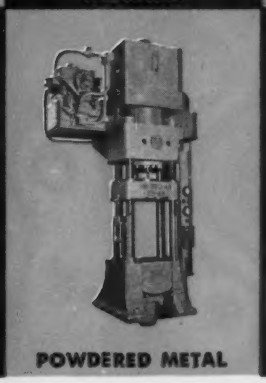


HOT FORGING

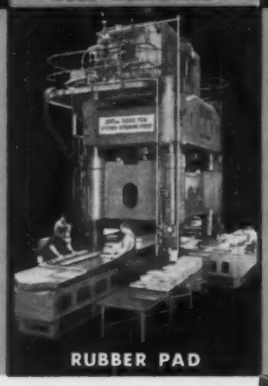


STRAIGHTENING

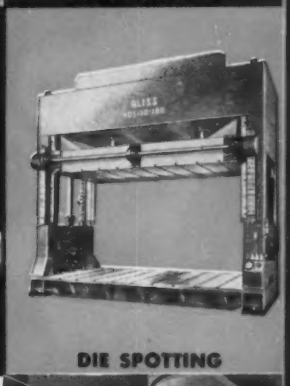
COINING



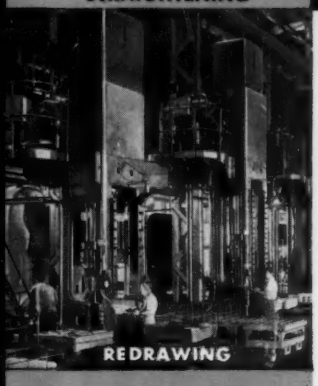
POWDERED METAL



RUBBER PAD



DIE SPOTTING



REDRAWING

COLD FORGING

HOBBING

FORCING

There's a BLISS Hydraulic Press for practically every operation

and this 36-page catalog describes the entire line

The Bliss line of Hydro-Dynamic presses is one of the most complete available. Whether you are working with sheet, plate or powder—requiring single, double or triple actions, housing or open-rod frames, slides that move up or move down—Bliss has a hydraulic press for almost every operation.

See this complete line for yourself. It is thoroughly described and illustrated in our new 36-page brochure. Write today for your copy of Bulletin 30-A.

BLISS SINCE 1857

on your press is more than a name...it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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E. W. Bliss (England) Ltd., Derby

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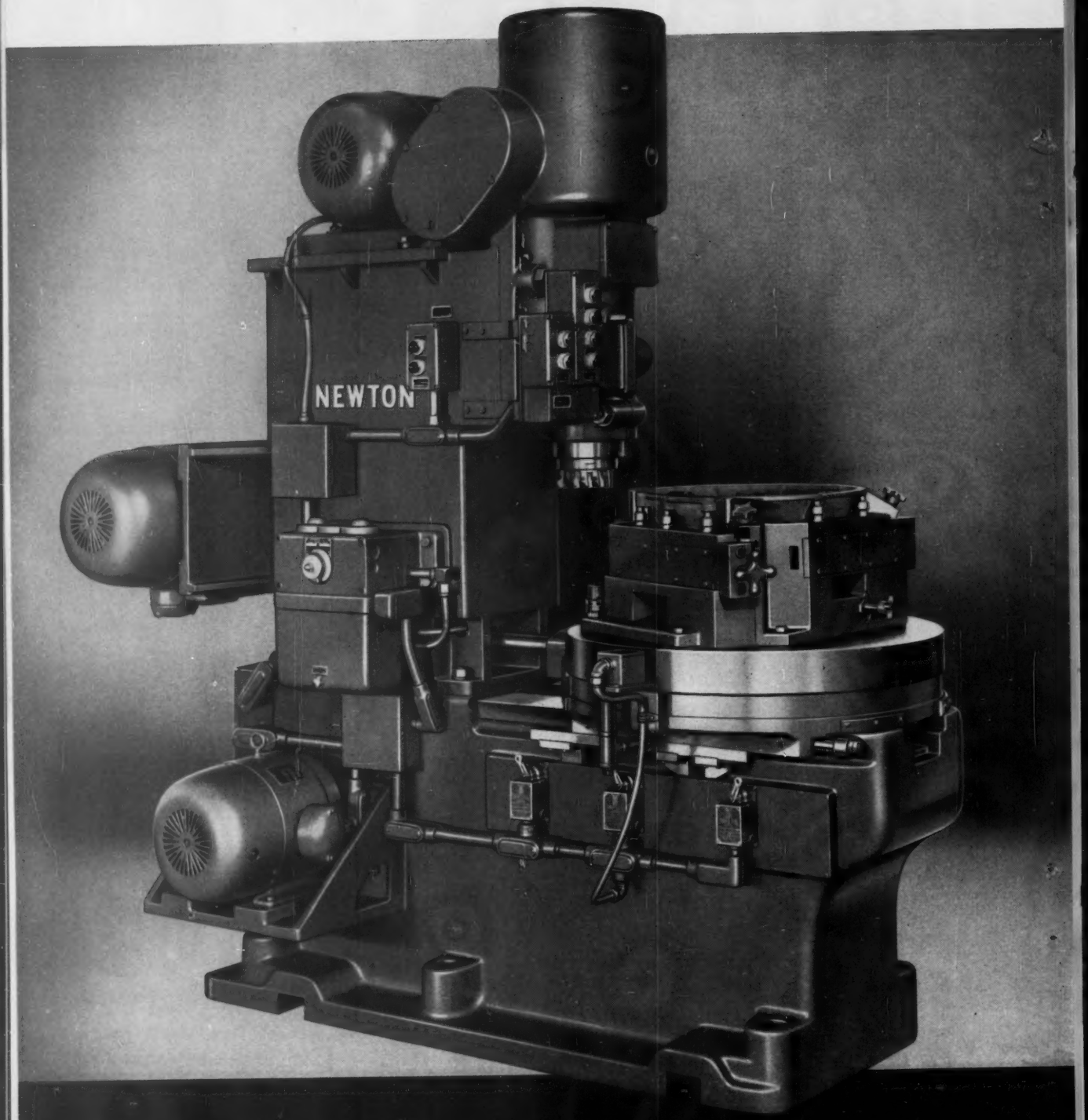
For Milling the flanges

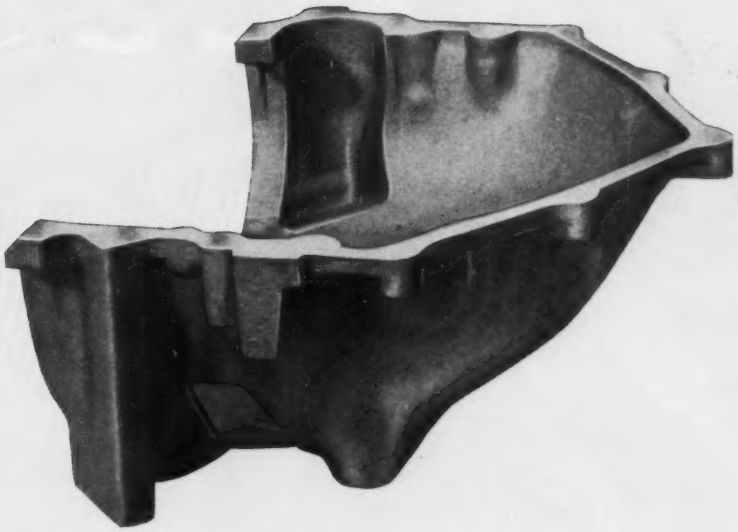


CONSOLIDATED MACHINE TOOL

A Division of Farrel-

of thin Castings...

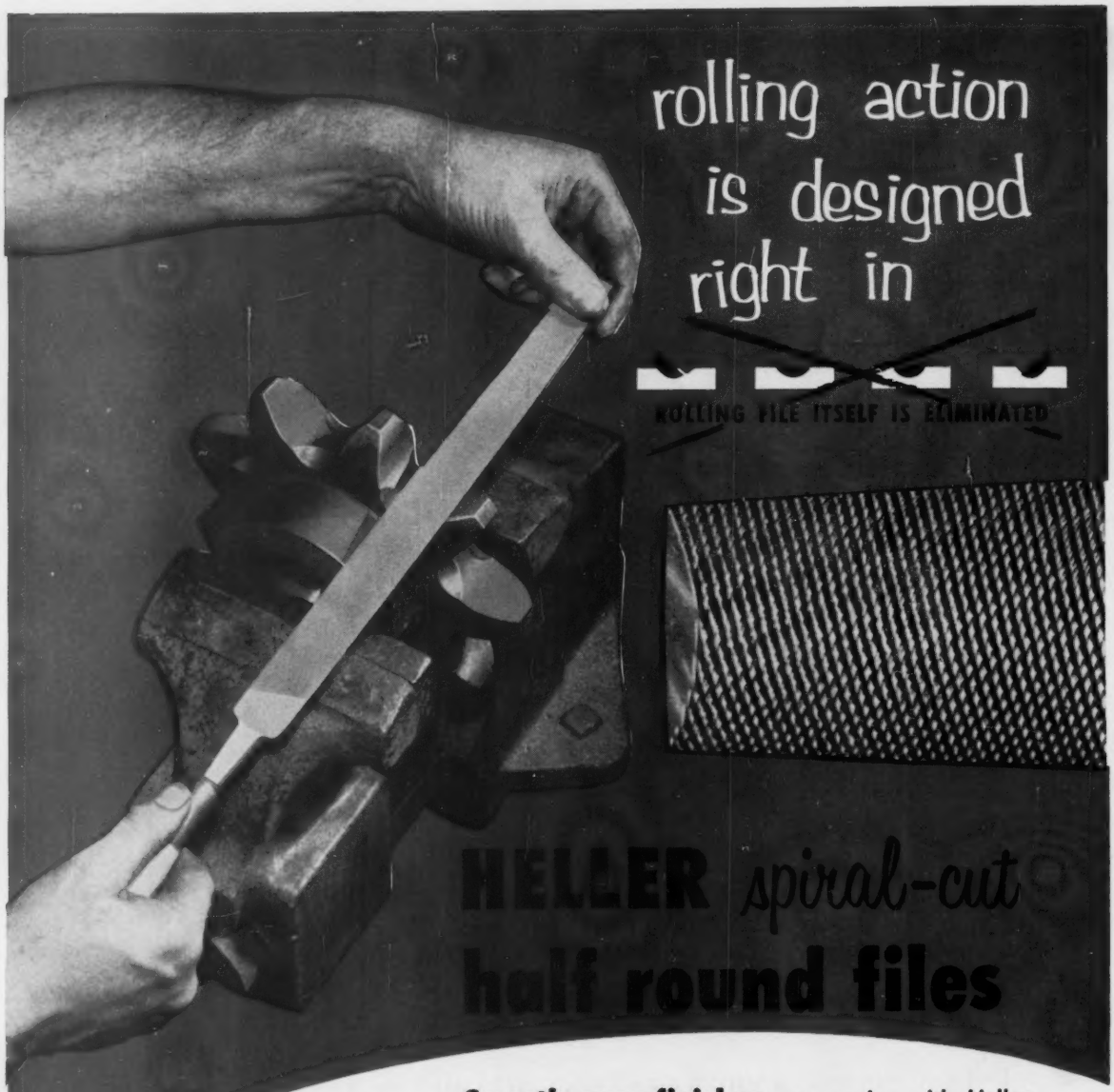
Newton Vertical Rotaries



- You *can't* mill the flange on this flywheel housing like you would a cylinder block. It's too thin for big diameter cutters.
- But you *can* mill it with a small diameter cutter on a Newton Vertical Rotary and *mill it fast!* All the operator does is load, push a button and unload. A 100 per cent automatic feed and traverse cycle does the rest.
- Of course, it is the *circular feeding of the table* that turns the trick and allows you to use small diameter cutters on this kind of work.

COMPANY, ROCHESTER 10, N. Y.

Birmingham Company, Incorporated



HELLER BROTHERS SINCE 1836 TRADE MARK

A NEW JERSEY CORP.

Smooth, even finishes are easier with Heller Spiral-Cut Half Round Files. Ordinary half round files require a skillful twisting. Heller engineering has removed this human element from good file performance. The necessary rolling action is designed right into the Heller Spiral-Cut Half Round File. This new cutting principal is typical of Heller's continuous search for better files. By constantly testing, inspecting, improving . . . Heller guarantees file users "the best."

VIXEN *American-Swiss* NUCUT
FAMOUS BRANDS MADE ONLY BY

HELLER BROTHERS COMPANY

America's Oldest File Manufacturer

BRANCH OFFICES . . . New York Chicago Detroit

NEWCOMERSTOWN, OHIO

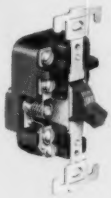
YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

For more information on products advertised, use Inquiry Card, page 257

WHAT ALLEN-BRADLEY

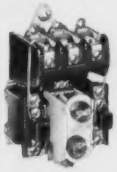
has to offer in manual and automatic motor controls as components for special control panels...

Fhp Starters



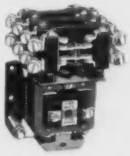
For motors of 1 hp or less. Provide dependable overload protection.

Manual Starters



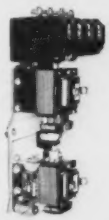
For a-c motors up to 5 hp, 220 v; 7½ hp, 440-550 v. Overload breakers.

Universal Relays



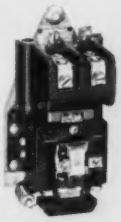
Up to 8 poles N.O. or N.C. contacts. Have double break, silver contacts.

Hum-free



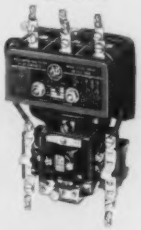
A magnetic latch keeps the contactor closed without using any coil current.

Contactors



Available in 8 sizes up to 900 amp. Solenoid operated silver alloy contacts.

Starters



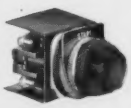
Solenoid starters in 8 sizes up to 300 hp, 220 v; 600 hp, 440-550 v.

Oiltight Accessories

Mushroom Push Button

Selector Switch

Control Station



Pilot Lights

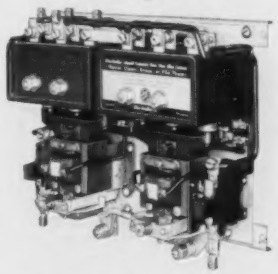
Drum Switches

For reversing, transfer, or pilot duty.

Limit Switches

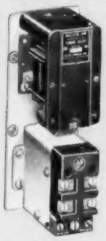
Oiltight. Wide variety of operating levers available.

Reversing Starters

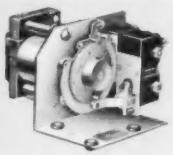


Two interlocked solenoid starters with dependable solder pot overload relays.

Pneumatic and Motor-driven Timers

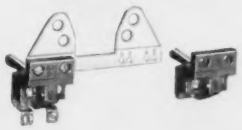


Has pneumatic bellows for timing from ⅛ to 180 sec.



Motor driven timer for laundry or other reversing service. Can be set for 2, 3, 4, or 6 motor reversals per minute.

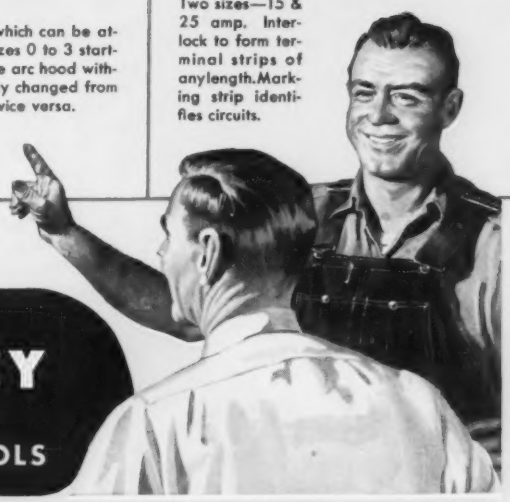
Auxiliary Contacts



Handy auxiliary contacts which can be attached to Allen-Bradley Sizes 0 to 3 starters. Mounted quickly on the arc hood without disturbing wiring. Easily changed from N. O. to N. C. contacts or vice versa.

Terminal Blocks

Two sizes—15 & 25 amp. Interlock to form terminal strips of any length. Marking strip identifies circuits.



Send for bulletins on above components.
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

A-B Quality

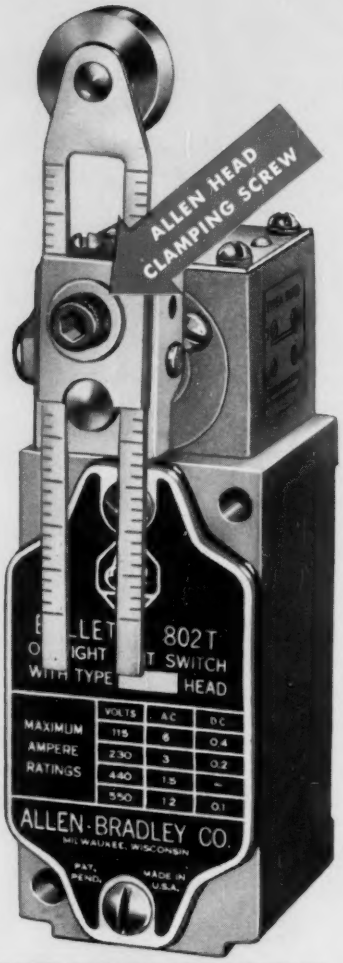
ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

4-55-R

NEW!

OILTIGHT LIMIT SWITCH
WITH ADJUSTABLE OPERATING LEVER



Another handy unit has been added to the broad line of Allen-Bradley oiltight limit switches... the NEW Type 802TG limit switch. The operating lever is adjustable from ¾ inch to 3 inches in radius.

The lever can be set at any angle on the shaft, and the operating head can be placed in any one of four positions—0—90—180—270 degrees on the body of the switch.

Like all Bulletin 802T limit switches shown here, the new unit has a snap action switch with double break, silver contacts. There is one normally open and one normally closed contact... electrically separated and protected by an oiltight seal. Terminals are easily accessible.

Roller Lever Maintained Contact

Flush Plate for Mounting Limit Switch in Cavity

Roller Lever Spring Return

Send for this 8-Page Bulletin

Bulletin 802T is a handy selection guide for picking the limit switch best adapted to your needs. Write for your copy, today.

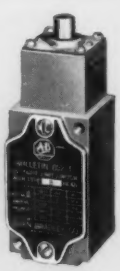
ALLEN-BRADLEY
QUALITY
LIMIT SWITCHES

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

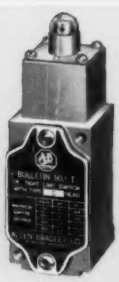
Fork Lever Maintained Contact

Flush Mounted Fork Lever

Rod Type Spring Return



Top Push Rod Spring Return



Push Roller Spring Return

Side Push Rod Spring Return

Side Push Rod Maintained Contact

4-55-MR

WHAT EVERY GOOD AUTOMATIC SCREW MACHINE OPERATOR SHOULD KNOW!

• The new R and L TOOLS CATALOG will make interesting, *profitable* reading to every good machinist. Interesting, because it contains a wealth of information about these "masterpieces of the toolmaker's art". Profitable, because it tells you how you can get all the precision and time-saving qualities built into every R and L TOOL.

This "Best Seller" is yours — Free for the asking.

Send us this coupon today.

R and L TOOLS
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog

☐ Please arrange for no-obligation demonstration of R and L TOOLS

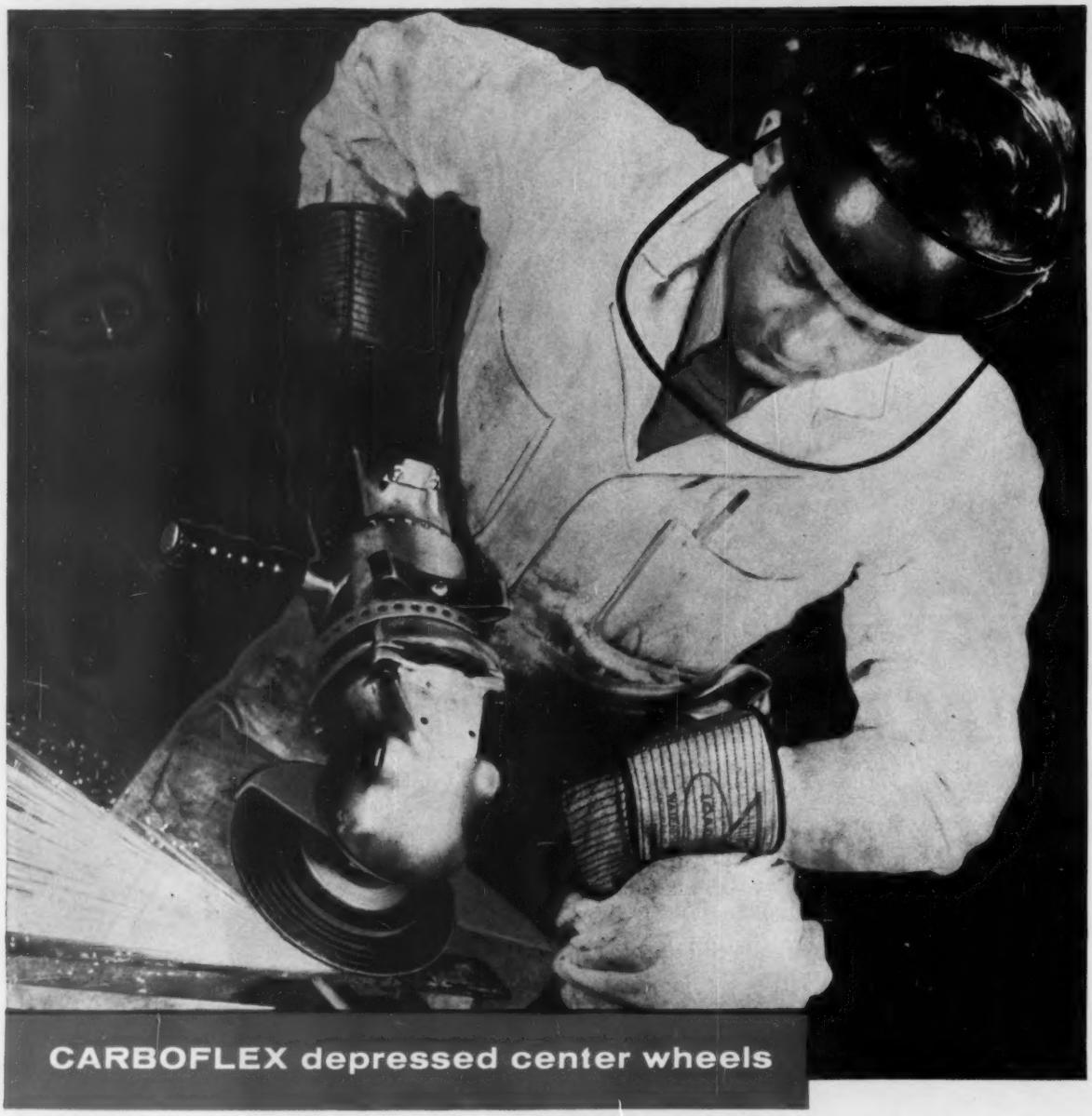
NAME

COMPANY

R and L TOOLS
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOO

Whether you're reducing **HEAVY WELDS** *... or*



CARBOFLEX depressed center wheels

... for faster... safer ROUGH GRINDING

CARBOFLEX Depressed Center Wheels will handle your roughest grinding jobs—cleaning castings, roughing off fins and sharp edges, notching and cutting off gates and risers. Each wheel is knurled on the back, as well as the face...lets you cut with either side, plus the edge, without initial dressing. And the resilient, strongly-reinforced bond resists cracking, offers maximum safety.

for **FREE** *booklets* giving complete information on CARBOFLEX and "MX" products, write The Carborundum Company, Dept. M 81-51, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

finishing sterling silver **FORK TINES . . .**

MX® fibre-reinforced wheels

. . . for faster . . . safer **FINISHING**

MX® Fibre-Reinforced Wheels provide a soft, cushion-like cutting action that reduces chatter and vibration . . . creates a smooth, uniform finish. "MX" cuts clean and resists loading, even on the softer metals and alloys. High tensile strength plus resistance to impact and heat shock means increased operator safety. And "MX" products wear slowly—remain usable right down to the arbor, shank or nut.

● **YOUR CARBORUNDUM DISTRIBUTOR** or salesman will be glad to demonstrate these cost-cutting products in your shop. Call him today—he's listed in the yellow pages of your phone book under "Grinding Wheels" or "Abrasives."

CARBORUNDUM

REGISTERED TRADE MARK

. . . continually putting more **SENSE** *in your abrasive* **DOLLAR**

81-51

For more information on products advertised, use Inquiry Card, page 257

Reversing Ram Makes Die Changes Easy

This ruggedly built press is an operator's delight. It is provided with a reversing ram drive which permits backing the ram or upper die away from the work at any point in the stroke.

Since parts are produced in small quantities on this press, the dies and machine settings usually must be changed many times during a day. The reversing ram and other fine features make this work easy and fast for the operators.

This press is rated at ½" x 14'-0" mild steel but will bend plate to 18'-6" long that can clear the 18" deep throat.

No Other Shear Has So Many Important Features

Operators in hundreds of plants all over the country have acclaimed the ease of operation of Steelweld Shears. They like them because they have features that ease their work and make for accuracy. Steelweld is the **only** pivoted-blade shear on the market. No other shear has the wonderful MICRO-SET knife adjustment. Every Steelweld Shear is provided with fatigue-reducing electric foot switch control as standard equipment.

This shear is rated at 10' x 1".

Inquiries Invited for:

- Shears
- Bending Presses
- Single-Point Presses
- Two-Point Presses
- Four-Point Presses

Single and double action types

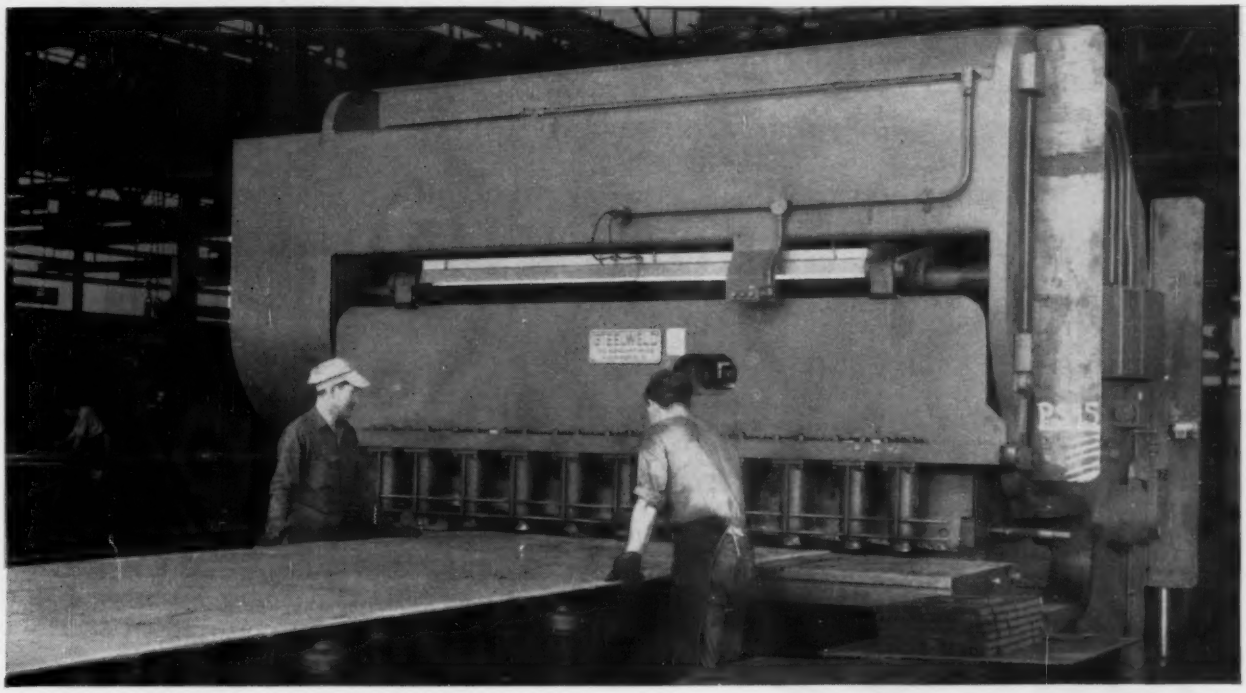
- Air Cushions

Operators LIKE STEELWELD MACHINES

THE MAN who operates a machine day in and day out usually gets to know it pretty well. If he has worked on various make machines, he is in a position to compare. He knows the good as well as the weak points. He can tell you what machines make his job easiest, what produce the most, what require the least maintenance. We have great respect for the operators and listen to what they say.

What we have been hearing about Steelwelds has elated us greatly. Briefly it is this: The operators have high regard for Steelwelds. They like their ease of operation which leaves them fresher at the end of the day. They approve the various adjustments with which Steelwelds are equipped and the simplicity of making them. They applaud the fact that the machines will operate continuously for long periods without need of attention.

The combination of the above factors, namely: Ease of operation, high production, excellent performance, and low maintenance, is hard to beat and accounts for the ever increasing popularity of Steelweld Presses and Shears.



GET THESE BOOKS!

Catalogs No. 1010 (Presses) and No. 1011 (Shears) give construction and engineering details. Profusely illustrated. Sent free.

THE CLEVELAND CRANE & ENGINEERING CO.

5458 E. 281 St., Wickliffe, Ohio

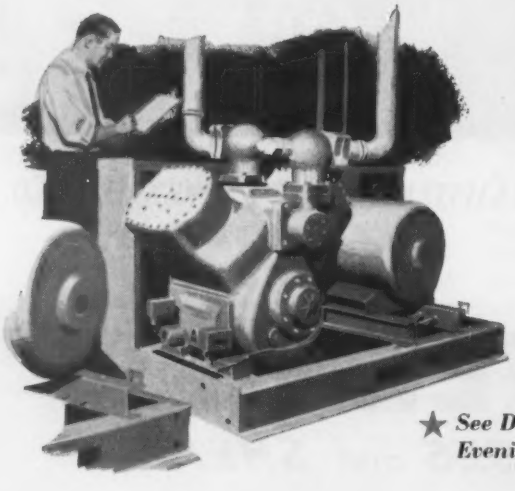
STEELWELD

PRESSES and SHEARS

For almost every industrial need you will find

Delco

preferred !

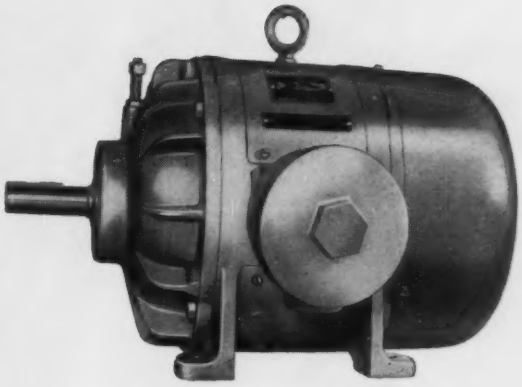


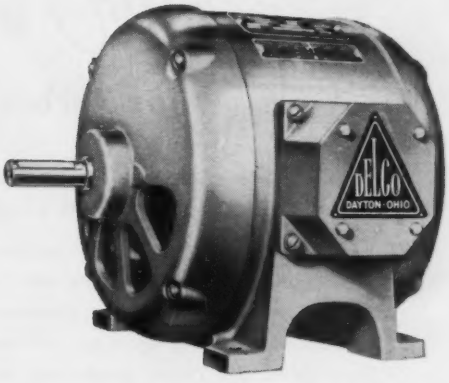
There's a Delco Electric Motor for nearly every industrial need. From the smallest integrals to totally enclosed, fan-cooled giants, Delco Electric Motors give peak performance and consistent dependability on any job.

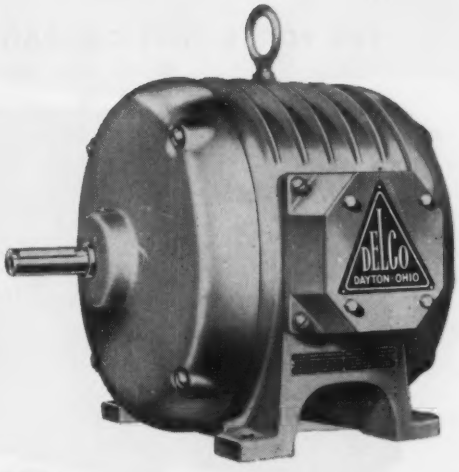
Even more important, your Delco Electric Motor is job-fitted to your special needs. Then it is *engineered* into your operation. Fact is, our Delco engineers sit down with your engineers and work to find the *right answer* to your motor problem.

★ ***See Delco Electric Motor national advertising in The Saturday Evening Post for the story of the full Delco Electric Motor line.***

DELCO
DAYTON OHIO







Each Delco motor is built to one rigid quality standard, and subjected to exhaustive tests through production. That's why Delco motors have been proved best by performance . . . why Delco motors are preferred by industry.

And wherever Delco motors go to work Delco parts and service facilities aren't far away.

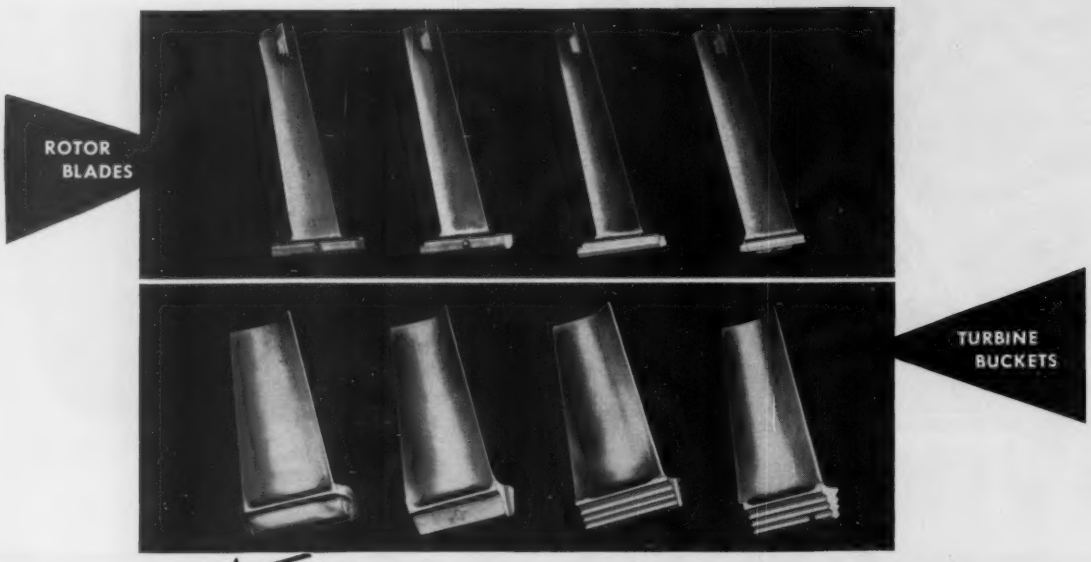
Delco Products, Division of General Motors
Dayton, Ohio.

GM GENERAL MOTORS DELCO

DELCO *Electric* MOTORS

PRODUCT OF GENERAL MOTORS

Proved best by Performance!



A *Faster* MACHINING METHOD

for Turbine Buckets, Rotor and Stator Blades

Footburt Surface Broaching has provided the means of reducing costs on many parts that are difficult to machine in large quantities by other methods.

Each application is individually engineered with rapidly operated fixtures for easy loading and unloading and with Broaches designed to take full advantage of the capacity of the machine. Our many years experience in pioneering the art of Surface Broaching will assure the best solution to your machining problems. Send prints and hourly production requirements for recommendations on the application of Footburt Surface Broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

☆*engineered for production*

FOOTBURT

PIONEERS IN SURFACE BROACHING

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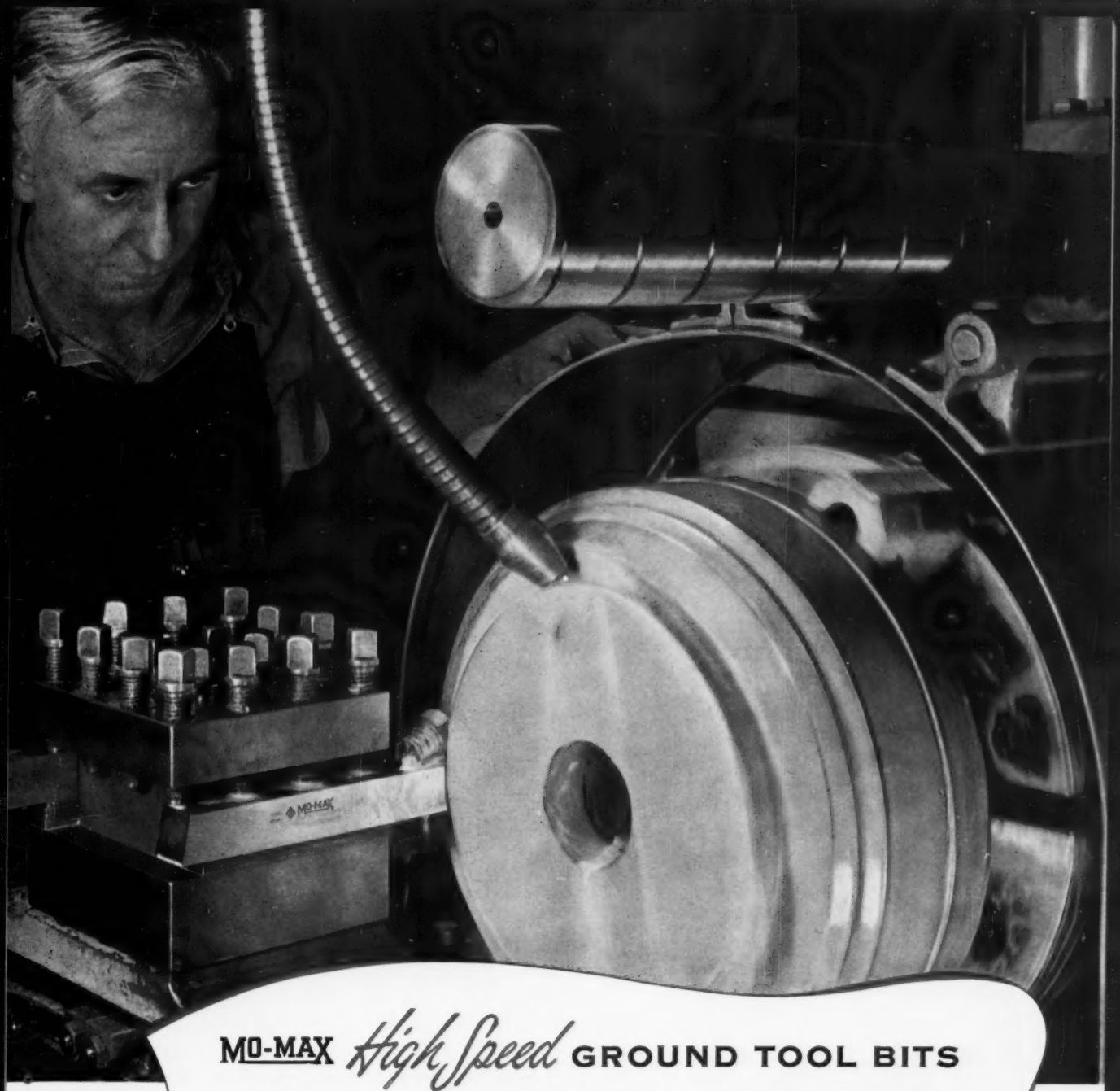


MO-MAX *High Speed* GROUND TOOL BITS

Tough and Rugged, with Superior Cutting Qualities

MO-MAX and MO-MAX COBALT Tool Bits have been used economically for many years in thousands of plants... under all conditions. Without exception they have proved conclusively that they perform better than other high speed steels. Try the MO-MAX brand on your next job.

THE **CLEVELAND** TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

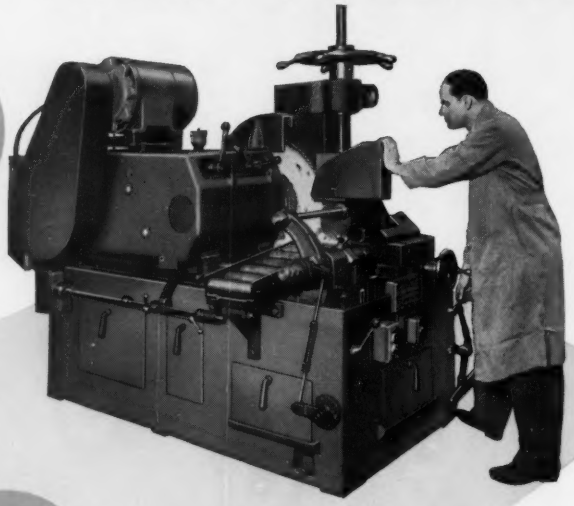
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

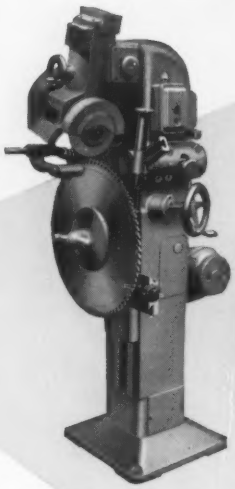
THE Triple-Chip METHOD IS A *Triple-threat* TO HIGH CUTTING COSTS

CIRCULAR SAWING MACHINES



M. & M. No. 3 circular sawing machine for cutting off metal up to 11-5/8" diameter.

SAW BLADE SHARPENERS



Three automatic M. & M. blade sharpeners impart the Triple-Chip or conventional grind to M. & M. saw blades up to 120" diameter.

SAW BLADES

M. & M. saw blades cut any machinable metal. Cut-off blades: segmental — 11" through 120" diameter; solid — 8" through 20" diameter. Slitting saws — 3" through 8" diameter.

You may profit immensely by applying the M. & M. Triple Threat to *your* cut-off costs. Machine, blade, and grinder, made by the first company to build all 3, often effect phenomenal savings, as proved by detailed case studies. *Just such a study of your job is yours for the asking.* We offer you an unmatched experience in the sawing of metal, ferrous or non-ferrous, titanium to magnesium, from 1/4" to 43" diameter.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

For more information on products advertised, use Inquiry Card, page 257

MEET THE CHAMP!

UNIVERSAL DRILL BUSHINGS BEAT ALL RECORDS FOR LONG LIFE AND ACCURACY

The extremely long life of Universal Drill Bushings is due to several factors. They are machined from finest quality steel. Their superfinish bores help to reduce both wear of the bushing and wear of the tools. Blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

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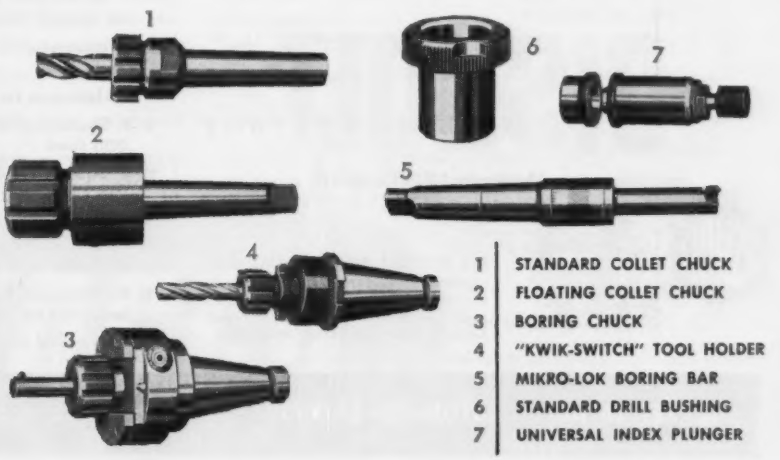
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 2
MICHIGAN



1	STANDARD COLLET CHUCK
2	FLOATING COLLET CHUCK
3	BORING CHUCK
4	"KWIK-SWITCH" TOOL HOLDER
5	MIKRO-LOK BORING BAR
6	STANDARD DRILL BUSHING
7	UNIVERSAL INDEX PLUNGER

you can
SAVE TIME
and
MONEY
on
jobs like this
with
the

...GISHOLT SPEED SELECTOR!

HERE'S WHY:

No manual gear shifting! You simply turn this hand wheel or touch a trip lever (for Direct or Pre-set operation). Shifting is automatic—by hydraulic power—while the operator positions the new tools for the next cut.

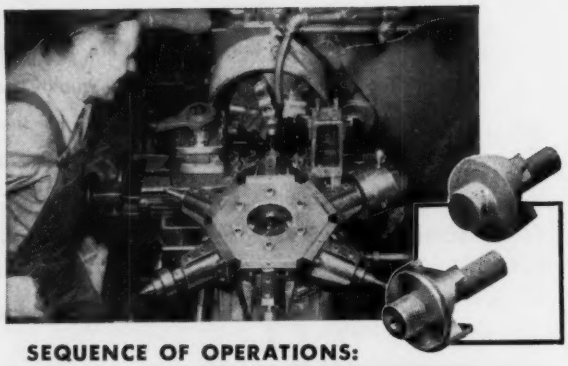
It's all so much simpler with the Speed Selector. There's no need for time-wasting computations, no mental effort, no physical effort. With simple controls, either direct or prearranged, the operator gets the ideal f.p.m. cutting speed for each cut. And it's *much faster,* of course!

The Speed Selector is standard on Gisholt Nos. 4 and 5 Ram Type Turret Lathes and on all Gisholt Saddle Type Lathes.

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

HERE'S HOW:



SEQUENCE OF OPERATIONS:

Note the star which indicates each time the Speed Selector is used.

★ **1. Hexagon turret—Center drill at 297 r.p.m. hand feed**

2. Hexagon turret—Support with live center

★ **3. Square turret—Rough turn and face at 96 r.p.m., .003 feed**

★ **4. Square turret—Finish turn, face and chamfer at 126 r.p.m. .002 feed**

★ **5. Hexagon turret—Start and drill through at 226 r.p.m., .003 feed. Trip the Hi-Lo lever, eliminating even the need for turning the hand wheel**

★ **6. Hexagon turret—Thread with tap at 39 r.p.m., leaders and followers**

—and you're ready for a new workpiece

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

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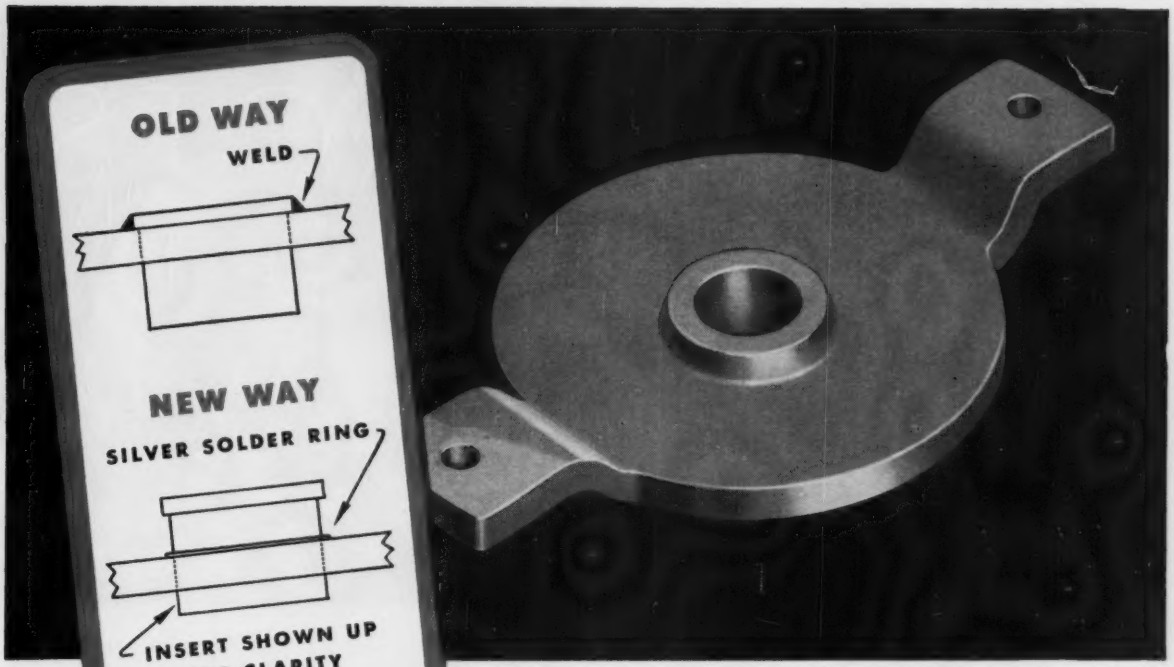


Assembly Cost *Cut 32%* with TOCCO* Induction Brazing

Now's the time to balance YOUR production budget

This assembly may bear no resemblance to your product, but its case is typical of the savings accomplished by Induction Heating of metal parts of all sizes and shapes.

Formerly the Norris Thermador Corporation used arc welding to join the bushing and clamp shown above. In an effort to reduce costs TOCCO Induction Heating was brought into the production picture with the following results:

OLD METHOD (Arc Welding)		**NEW METHOD** (TOCCO Induction Brazing)	
Material (rod)	$ 4.56 per M parts	Material (solder and flux)	$13.83 per M parts
Labor	20.63 per M parts	Labor	8.82 per M parts
Overhead	21.25 per M parts	Overhead	9.08 per M parts
Total Cost Old Method	$46.44 per M parts	Total Cost TOCCO Method	$31.73 per M parts

TOCCO Engineers are glad to survey your operations for similar cost-cutting results — no obligation, of course.

THE OHIO CRANKSHAFT COMPANY

TOCCO

Mail Coupon Today

NEW **FREE** BULLETIN

THE OHIO CRANKSHAFT CO.
Dept.M-4, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering."

Name_____

Position_____

Company_____

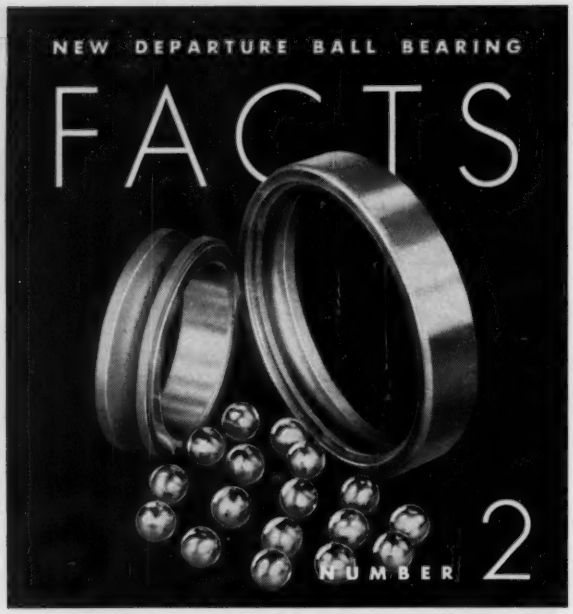
Address_____

City_____ Zone____ State_____

For more information on products advertised, use Inquiry Card, page 257

END MAINTENANCE PROBLEMS

with Bearings "Built to Be Forgotten!"



When machine design calls for bearings in inaccessible places, serious maintenance problems often arise. Disassembly for bearing replacement or adjustment is usually costly in both man-hours and lost production. Much the same holds true for many consumer products that must take use and abuse, yet operate efficiently over long periods.

BALL BEARINGS THE SOLUTION

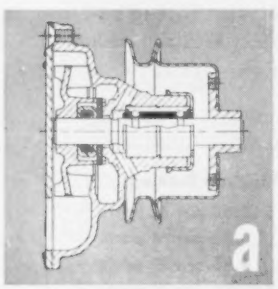
Fortunately, the engineer today has a ready answer at hand. Because of certain unique advantages, ball bearings are ideal in virtually all cases. Ball bearings are permanent, fixed units. When properly enclosed they operate over extremely long periods with practically no wear. Thus, the various parts of the bearing retain their accurate interrelationship. In effect, this means that ball bearings are the most practical of all anti-friction bearings to fit with permanent seals. Lubricant can be enclosed for lifetime operation in many services.

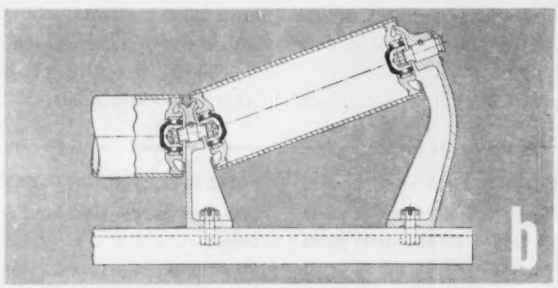
THE SEALED-FOR-LIFE BEARING

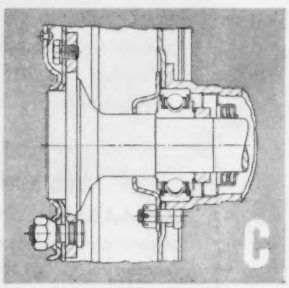
The most logical choice in applications such as those outlined is New Departure Sealed-for-Life bearings. This great advance in bearing design was originated and developed by New Departure. More than 266 million of these bearings have proved their value in service.

In case after case, New Departure Sealed-for-Life bearings have cut maintenance costs to the zero point. Truly, they are *"built to be forgotten"!*

Consult with New Departure on your bearing problems. You will find the experience gained through more than 50 years of designing, testing and manufacturing bearings a major assistance.







A. The automotive fan and pump shaft bearing originated by New Departure demonstrates advantages of the sealed-for-life principle. This bearing has eliminated all the old water pump troubles and service. It requires no relubrication or adjustment. It has proved that it is "built to be forgotten," through use in cars and trucks everywhere.

B. Conveyor roll units constructed around New Departure conveyor bearings require remarkably few parts. Bearings are sealed and lubricated for life. Savings in labor and lubricant are most pronounced. Units with these bearings are economical to produce and easy for the operator to set up. They also are "built to be forgotten."

C. The New Departure rear wheel bearing has made it possible for the engineer to design the simplest, strongest and most foolproof of mountings. This permanently sealed bearing requires no adjustment or relubrication. Grease gun fittings are eliminated. It is famous because it has demonstrated in millions of rear wheels that it needs no attention . . . it can be forgotten.

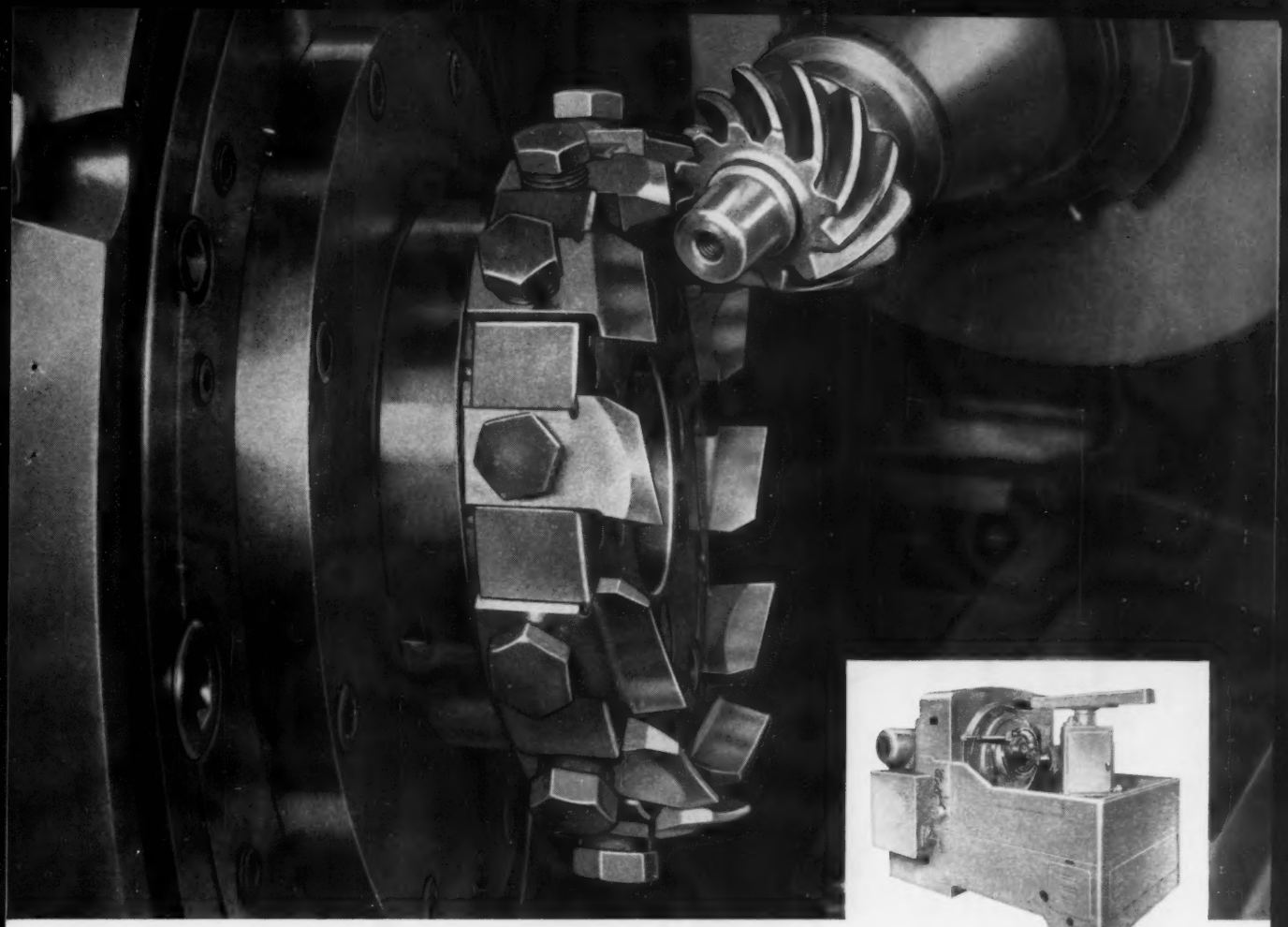
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

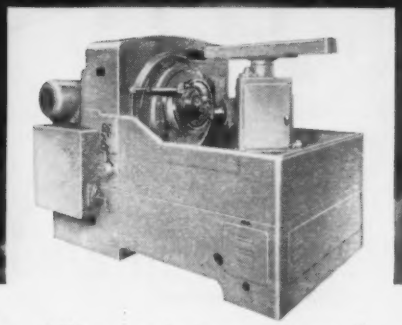
Send for Booklet D-6 on sealed ball bearings

NEW DEPARTURE
BALL BEARINGS

NOTHING ROLLS LIKE A BALL

For more information on products advertised, use Inquiry Card, page 257





Jobbing or production quantities are efficiently handled with the new Gleason No. 106 Hypoid Generator.

This new generator cuts medium-size bevel gears *faster than ever!*

Several things have been done to make this new Gleason No. 106 Hypoid Generator the fastest machine for producing medium-size bevel gears.

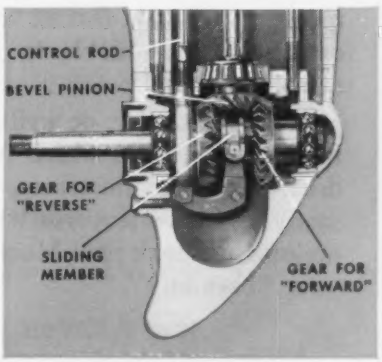
For example, new generating and feed mechanisms coupled with rigid construction give more efficient cutting cycles, speeding up cutting time. In addition, the new generating method assures excellent finish, and maximum cutter life.

Few adjustments required

Since fewer adjustments are necessary, faster setup and change-over are attained.

Extreme operating flexibility is one of the outstanding features of the 106. This permits its use for jobbing, production and completing. When it is arranged for completing, gears are finished directly from the solid blank.

This machine handles gears from 2″ to 8½″ diameter, 4DP and finer, with ratios up to 10/1, cone distances up to 5¼″. We will gladly send you more details on request.



Spiral bevel gears similar to those in this outboard motor drive are cut accurately and quickly on this Gleason machine.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

For...

General-Purpose Sawing

with

High Speed

Accuracy, Economy

Model 4B/M2/E2
Equipped with standard
work track
(Optional Equipment).

MARVEL No. 4B

HIGH SPEED HACK SAW

Exclusive features

1. Horizontal Ball Bearing Saw Frame.
2. Screw Feed—Automatic or Hand Operated.
3. Quick Return Stroke—allows greater number of strokes per minute.
4. Simple Positive Coolant System.
5. Adjustable Stroke—can be shortened for larger capacity.
6. Speed Range—available in 1, 2 or 4 speed models for wider range of work.

Let us prove to you the many reasons why this MARVEL Hack Saw offers the cheapest, most accurate and fastest "cut-off" method available to you at a low initial cost.

Ask your dealer, or write us for Bulletin GP35 which fully describes and illustrates the many exclusive features which makes this Hack Saw Machine your "best buy".

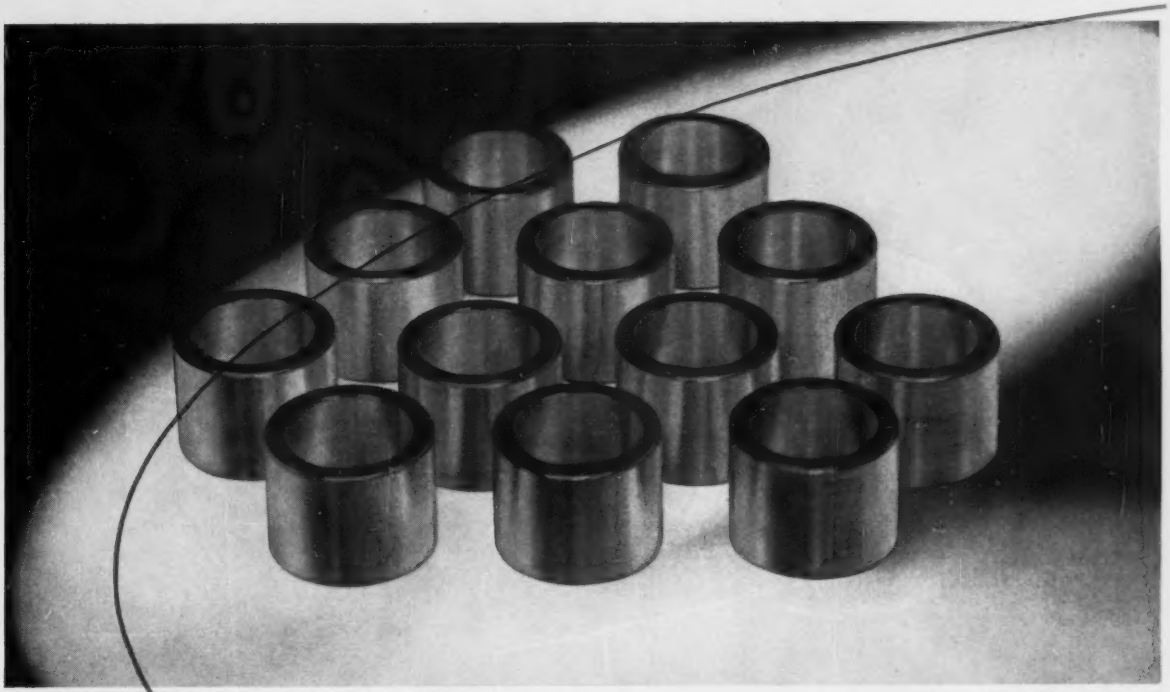
Metal Cutting

MARVEL SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. · 5700 Bloomingdale Avenue · CHICAGO 39, ILL.

For more information on products advertised, use Inquiry Card, page 257



these requirements in mind...

So varied are the demands on multiple spindle automatics it is impossible to design into one model — or a number of models — all the facilities that will satisfy every requirement. To excel in any range of work the design of a machine of this type must be directed toward that work.

Cone's new General Datalog lists over forty CONOMATIC models that are designed with these requirements in mind. For any range of work, Conomatics are built to more efficiently serve the latest cutting tool materials.

data for comparison

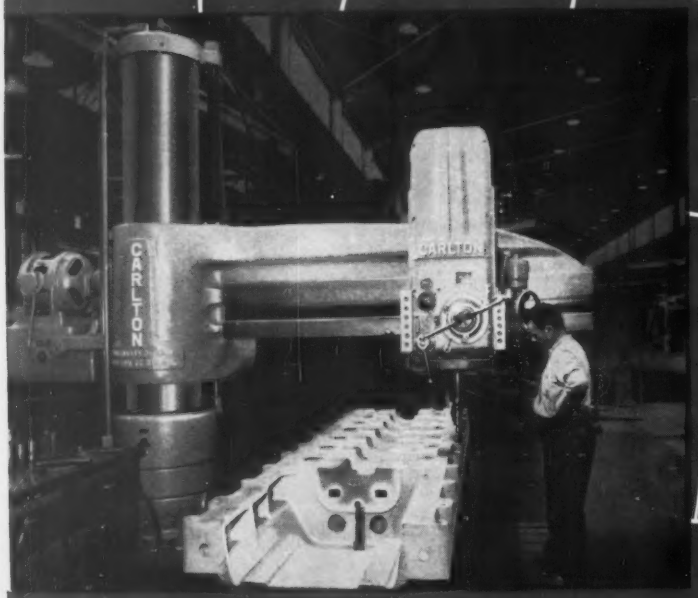
Part	Bushing
Machine	1⅛" Six Conomatic
Tools	100% Carbide Tipped
Material	Stainless Steel Tubing
Stock Size	1¼" OD; ¾" ID
R. P. M.	Work Spindle — 1033 Opposed Spindle—1048
Time	7 Seconds per Cycle 3.5 Seconds per Piece

Conomatic}

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Carlton

cuts drilling costs

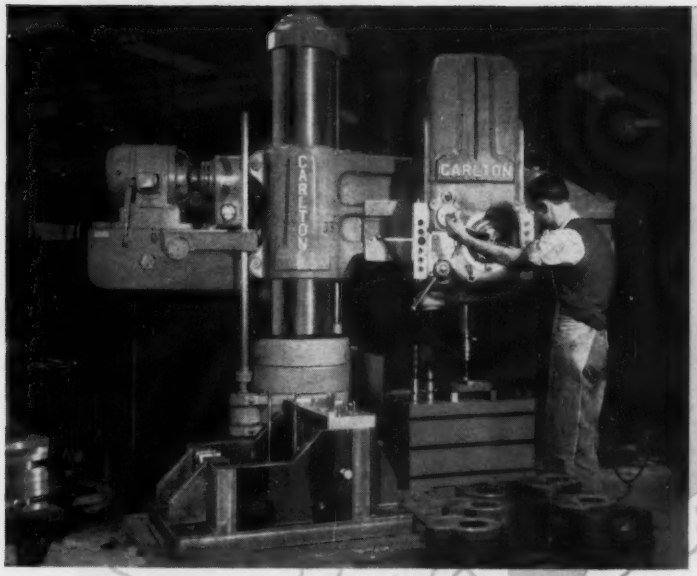


WEST

The huge Carlton 5A radial drill at Enterprise Division, General Metals Corp., San Francisco, can drill heavy work like this . . . yet can be used with equal success for smaller, more sensitive requirements.

SOUTH

National Supply Co. uses the Carlton 4A radial drill at their new Gainesville, Texas plant for drilling structural members of oil-field pumping units.



NORTH

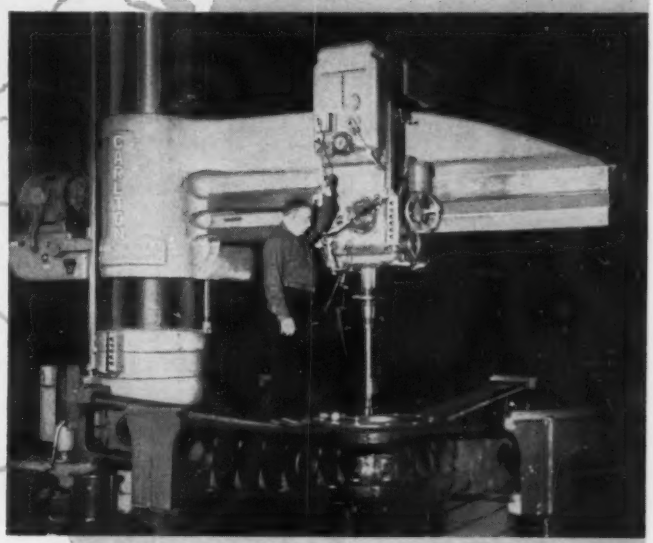
Carlton 3A radial drill machining a cam used on an automatic concrete block machine manufactured by the Besser Co., Alpena, Mich. Precision, rigidity and pushbutton control make Carlton first choice at Besser Co.

all over the U. S.

Carlton radial drills available in arm lengths from 3-ft. to 12-ft., and column diameters from 9" to 26". Carlton horizontal drills made in 4H and 5H sizes. For complete information, call your machine tool distributor, see the Carlton brochure in Sweets Machine Tool Catalog file, or write The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton can cut your drilling costs, too . . . in three ways: (1) Because Carlton can handle a broader range of work (¼" to 10" diameter holes on the 19" column 4A, for example), you need less drilling equipment. (2) With Carlton accuracy you drill it right the first time—there's no lost motion. (3) And with the help of Carlton engineered tooling, you can be sure of higher drilling rates. Why not write us today and get the 'hole' story? The Carlton Machine Tool Co., Cincinnati 25, Ohio.

"THE HOLE STORY" gives complete information and specifications on Carlton OA, 1A, 3A, 4A and 5A radial drills. Write for your copy . . . please specify size desired.



EAST

Westinghouse Electric Corp., East Pittsburgh, selected this Carlton 5A radial because of its enormous capacity. The Carlton honing attachment shown provides uniformity of hole size to within 1 micro-inch.

Carlton
Horizontal and radial drills

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO

PLATED UNBRAKOS AT WORK

UNBRAKO FORMULA FOR PLATED SCREW QUALITY. Make the screw precisely undersize with the finest machines. Plate it under rigidly controlled conditions in the best available plating equipment. Guarantee the finished product—Class 3A thread tolerance after plating. It is this unique formula that permits us to supply, with extremely good delivery, the plated UNBRAKO socket head cap screws for such precision applications as this high-speed centrifugal separator used in the processing of fish oils. The story of plating at SPS is told in "Precision Plating—a product and a service." See your authorized industrial distributor or write on your business letterhead for a copy of it. STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

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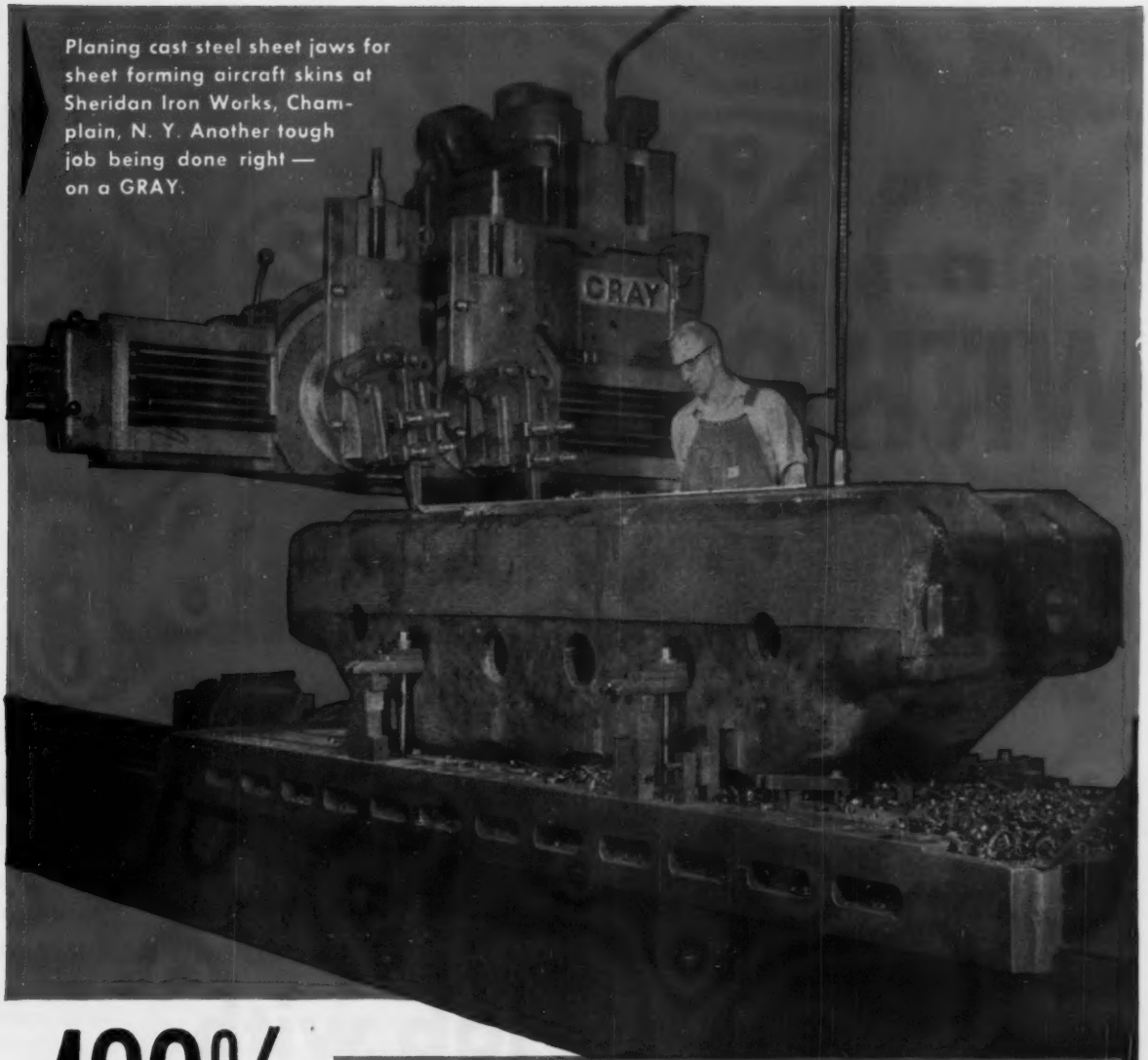

Planing cast steel sheet jaws for sheet forming aircraft skins at Sheridan Iron Works, Champlain, N. Y. Another tough job being done right — on a GRAY.

400%

...production increases can be obtained through carbide planing with a GRAY heavy duty OPENSIDE PLANER

. . . reports the Sheridan Iron Works, Champlain, N. Y. where a line of GRAY openside planers are delivering high production at low cost.

Everywhere, the odds are constantly increasing in favor of the GRAY.

Its astonishing rigidity permits heavy hogging with precision finish cuts.

Its openside design means "plus" value capacity, greater versatility.

Get the benefits of substantial savings in time and money with a GRAY heavy duty openside planer.

Write today. Get the story on GRAY

HIGH
low cost
PRODUCTION

Dept. B

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

NOW...
WITH ONE MACHINE
YOU CAN SELECT
the ideal arc
AC or DC
for every job with
LINCOLN
IDEALARC®

4 types of arc at your fingertips

★ AC SOFT ARC

★ AC FORCEFUL ARC

★ DC SOFT ARC

★ DC FORCEFUL ARC

TO THE MAN WHO USES AC

For the first time . . . an AC welder with truly stable arc —*plus* choice of soft arc for smooth, clean welds; forceful arc for maximum in penetration and non-sticking operation.

TO THE MAN WHO USES DC

For the first time . . . a heavy duty, dependable DC welder that combines the efficiency of the rectifier with versatility of selecting a soft and forceful arc. *Then you can switch to AC instantly, where the job can be done better with AC.*

TO THE MAN WHO USES BOTH AC AND DC

For the first time . . . in *one* machine, both AC and DC with selection of soft arc or forceful arc in either AC or DC. Gives you the ultimate in speed, ease, low cost.

START CUTTING COSTS . . . NOW!

Send for Bulletin 1343 showing how hand welding can be simplified, done faster, for lower cost. Write

GET THE FACTS
SEND FOR BULLETIN 1343

THE LINCOLN ELECTRIC COMPANY

Dept. 1202 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

a practical approach to pressroom modernization

Announcing

TWO NEW Verson PLANS

to solve press obsolescence problems

The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the fair profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you are one of the manufacturers faced with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problems.

Customized

INSTALLMENT PROGRAM

For the manufacturer who wishes to own his own presses but minimize his initial capital outlay, Verson offers a Customized Installment Program. It is called "Customized" because the payment plan is tailored to the buyer's own financial requirements rather than to a single fixed plan. Initial payments may be as low as 10 per cent of the purchase price with the balance payable over periods ranging from six months to five years. Further information on a plan to meet your needs will be furnished on request. Please outline your requirements.

Customized

LEASING PROGRAM

For the manufacturer who wants the advantages of modern, efficient presses without capital investment, Verson offers a Customized Leasing Program. Like the Installment Program, a choice of plans is available to best suit the buyer's requirements. In addition to the basic plans, options for continuation, termination and eventual purchase are also available. Special arrangements for special machines will be considered. Further information on a leasing plan to suit your needs will be furnished on request. Please outline your requirements.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

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praise from Caesar...

The Salt Lake Tribune, Sunday, June 20, 1954

Here's the New McGee and Hogan

Radial Drilling Machine

With its 5-foot arm, this modern machine is capable of driving a 3" diameter drill to capacity through the center of a 10-foot diameter solid steel work piece. Also used for tapping and large boring operations, it is the only really modern radial of such dimensions in any intermountain machine shop doing repair work.

Veteran operator Pat Langford, above, finds the centralizing of all controls on this machine a big advantage over old-fashioned, scattered control points. Time saved means lower costs per job.

McGEE & HOGAN
MACHINE WORKS
1154 South 2nd West - Salt Lake City - 84-5291

When a customer of such outstanding caliber and recognized reputation as the McGee & Hogan Machine Works of Salt Lake City, Utah spends his own good money to tell the world how good his new "AMERICAN" Hole Wizard Radial is that's really "Praise from Caesar."

The accompanying McGee & Hogan advertisement appeared in the Sunday, June 20th, edition of The Salt Lake Tribune. It shows the new 5' 13" "AMERICAN" Hole Wizard Radial at work in their plant producing work for customers at "lower costs per job."

Lots of power, wide range, convenient controls and plenty of ruggedness are doing for McGee & Hogan Machine Works exactly what "AMERICAN" Hole Wizard Radials will do for you.

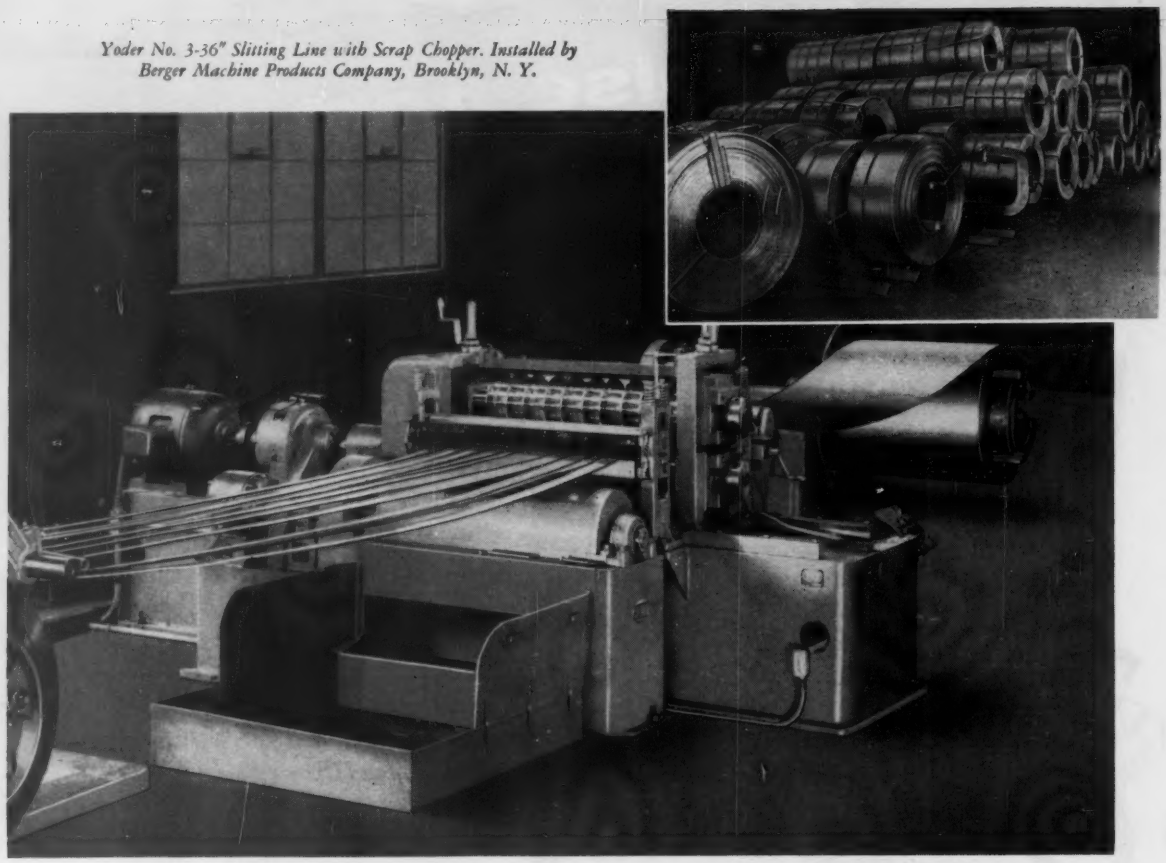
And Mr. Ray Hogan adds another punch to this testimonial by telling us in a recent letter, "Your machines are doing a wonderful job for us."

Send for bulletin No. 327 and get the facts.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes · Hole Wizard Radial Drills

Yoder No. 3-36" Slitting Line with Scrap Chopper. Installed by Berger Machine Products Company, Brooklyn, N. Y.



To Slit or not to Slit *your own strip...*

In a certain strip mill, slitting big tonnages of heavy coils, a Yoder high speed slitting line for many years has been paying for itself about every three months. Such a line is, however, far too big and costly for tonnage requirements in most plants.

For metal fabricators and warehouses handling smaller coils and tonnages, Yoder offers a selection of lower cost slitters, uncoilers and recoilers, capable of handling an astonishingly wide range of coil weights, widths and gauges, at speeds sufficient to make their operation profitable on a surprisingly small volume.

The revised fourth edition of the YODER SLITTER BOOK, just off the press, contains production records, time studies and other data helpful in determining to what extent a slitter may be profitable in your plant, be your requirements small or big.

A copy is yours for the asking. Also estimates and recommendations, without cost or obligation on your part.

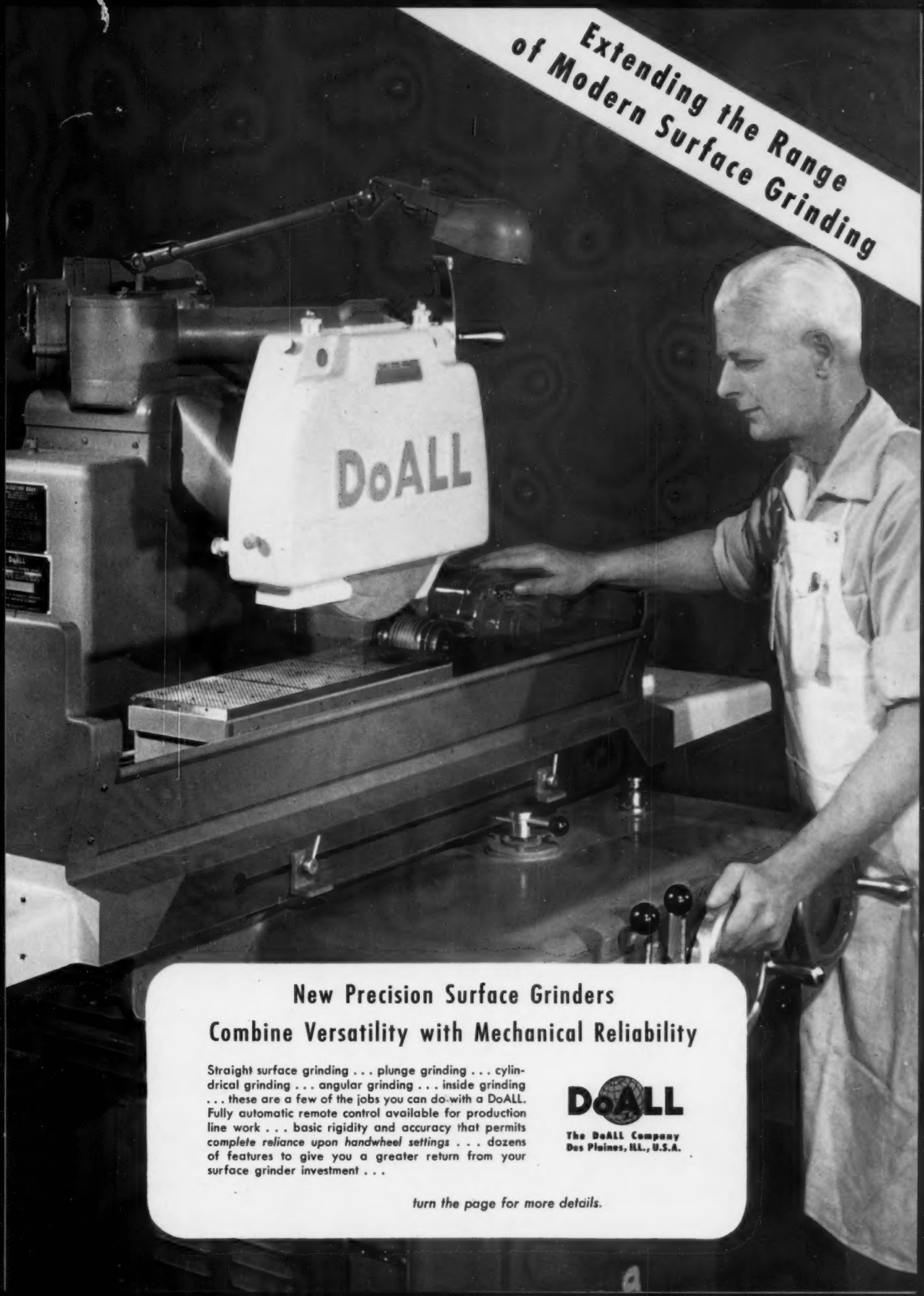
THE YODER COMPANY • **5504 Walworth Ave., Cleveland 2, Ohio**

Complete Production Lines

- ★ **COLD-ROLL-FORMING** and auxiliary machinery
- ★ **GANG SLITTING LINES** for Coils and Sheets
- ★ **PIPE and TUBE MILLS**—cold forming and welding

ENGINEERING YODER MANUFACTURING

For more information on products advertised, use Inquiry Card, page 257



New Precision Surface Grinders
Combine Versatility with Mechanical Reliability

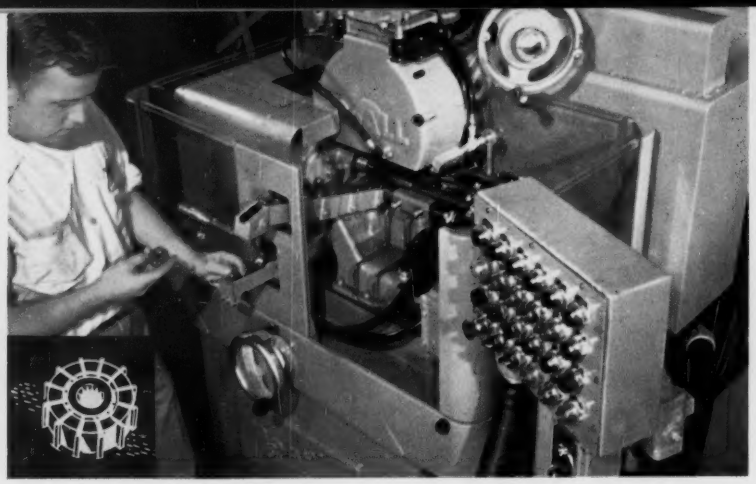
Straight surface grinding . . . plunge grinding . . . cylindrical grinding . . . angular grinding . . . inside grinding . . . these are a few of the jobs you can do with a DoALL. Fully automatic remote control available for production line work . . . basic rigidity and accuracy that permits *complete reliance upon handwheel settings* . . . dozens of features to give you a greater return from your surface grinder investment . . .

DoALL

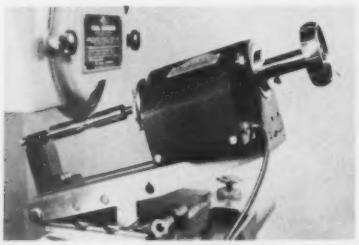
The DoALL Company
Des Plaines, Ill., U.S.A.

turn the page for more details.

AUTOMATION GRINDING—special DoALL Grinder for precision finishes on deflection yoke segments far color television tubes.



SPECIAL FULLY AUTOMATIC GRINDER for grinding slots in power steering pump rotors. Parts indexed, ground and ejected.



CYLINDRICAL GRINDING

ANGULAR GRINDING

"COOL GRINDING"* (coolant through the wheel) reduces heat, prevents checks and cracks, permits higher speeds, heavier feeds. Note fine mist from wheel on blotter.
*U.S. Pat. No. 2470350

You Get More Return On Your Investment When You Specify DoALL Surface Grinders

New DoALL Precision Surface Grinders are designed to reduce production line and toolroom costs through new performance standards:

1. Precision that permits complete reliance upon handwheel settings, eliminates frequent checking, increases output and reduces errors.
2. Versatility that provides straight surface grinding, grooving, slotting, notching, internal grinding, crush form grinding, cylindrical grinding and other operations with the same machine.
3. Power and rigidity plus "Cool Grinding" to produce heavier cuts and faster operation without sacrifice of accuracy, finish and wheel life.
4. A complete line of accessories to best meet the requirements of any toolroom or production operation.
5. Modification of basic grinders is available for any special applications.

★Combination hydraulic and manual table and crossfeed traverse standard on all models.

★Optional, all models:

- Fully automatic operation (table, crossfeed, downfeed)
- Combination flood cooling and "Cool Grinding" (coolant flows through wheel.)
- Flood coolant system
- Variable speed spindle drive
- Universal high-speed spindle
- Cylindrical grinding and indexing attachment
- Crush form grinding equipment . . . plus many others.

See these new models before you buy—through an actual demonstration at your plant you will see what these machines can do on your grinding operations. There is no obligation. Call your local DoALL Store—see classified listing in your phone book—or write THE DoALL COMPANY.

NEW MODELS

7 new models from 6″ x 18″ to 10″ x 30″. 4 chuck sizes. 5 wheel sizes—7″, 8″, 10″, 12″, 14″. Work height capacity is 12½″.

ASK FOR CATALOG

Films —two color sound movies for group showings: "Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding".

Friendly DoALL Stores . . . (in 40 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

Call Your DoALL Service-Store
DoALL SAW BANDS
DoALL GRANITE SURFACE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.

EDUCATIONAL STUDY WALL CHARTS

Economic Principles

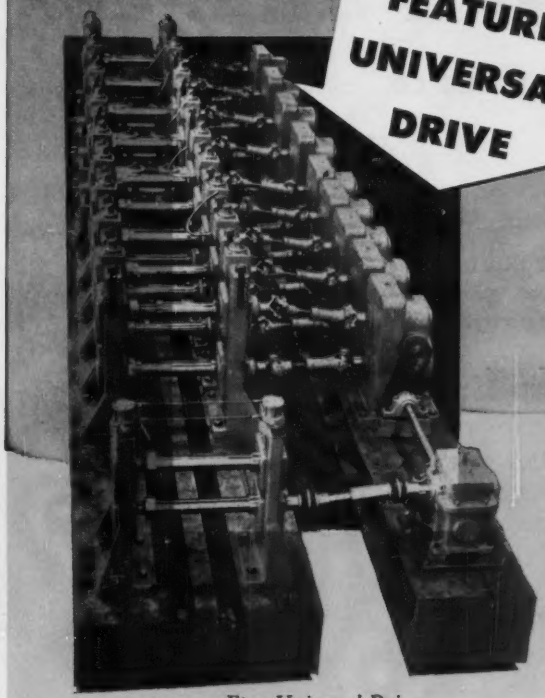
$1.00 each postpaid

Lower quantity prices.

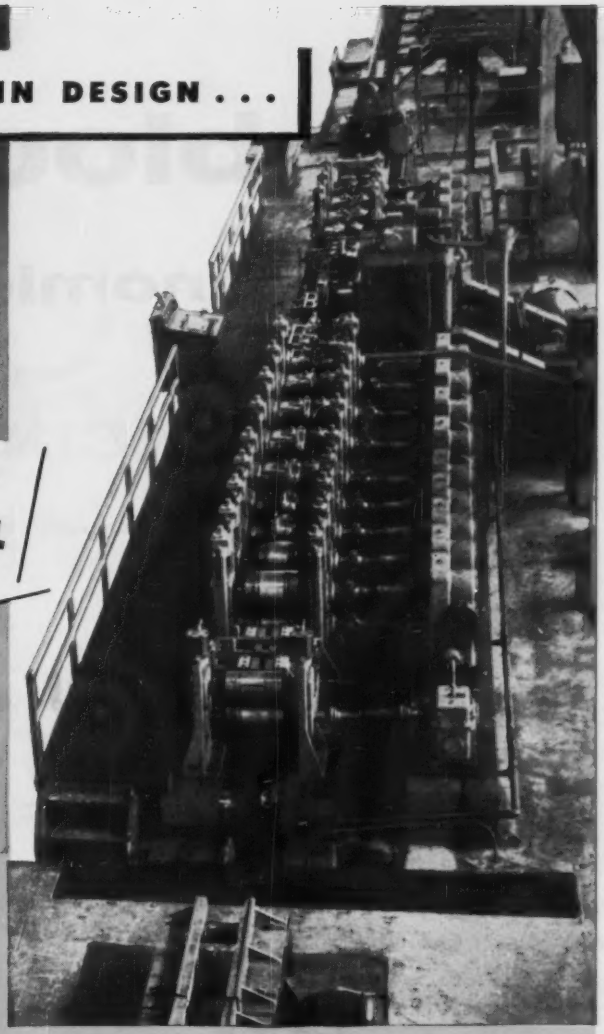
LEADING THE INDUSTRY IN DESIGN . . .

Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive



You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced.* Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

For more information on products advertised, use Inquiry Card, page 257

die blocks accurately

economically shaped...

on a CINCINNATI SHAPER

at the **DROP DIES AND FORGINGS CO.,** Cleveland, Ohio

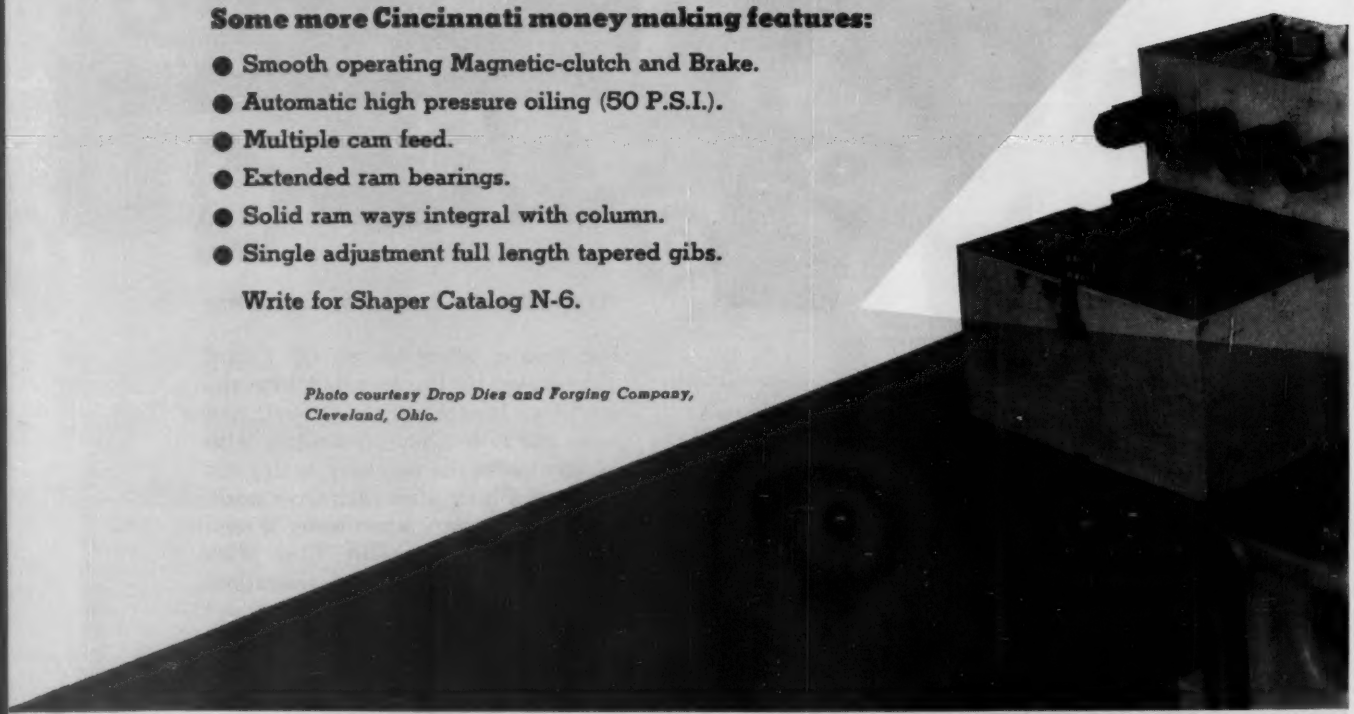
Accuracy and convenience make money for this customer. This accurate Cincinnati Shaper and the convenient special die block vise are factors in this economy.

Some more Cincinnati money making features:

- Smooth operating Magnetic-clutch and Brake.
- Automatic high pressure oiling (50 P.S.I.).
- Multiple cam feed.
- Extended ram bearings.
- Solid ram ways integral with column.
- Single adjustment full length tapered gibs.

Write for Shaper Catalog N-6.

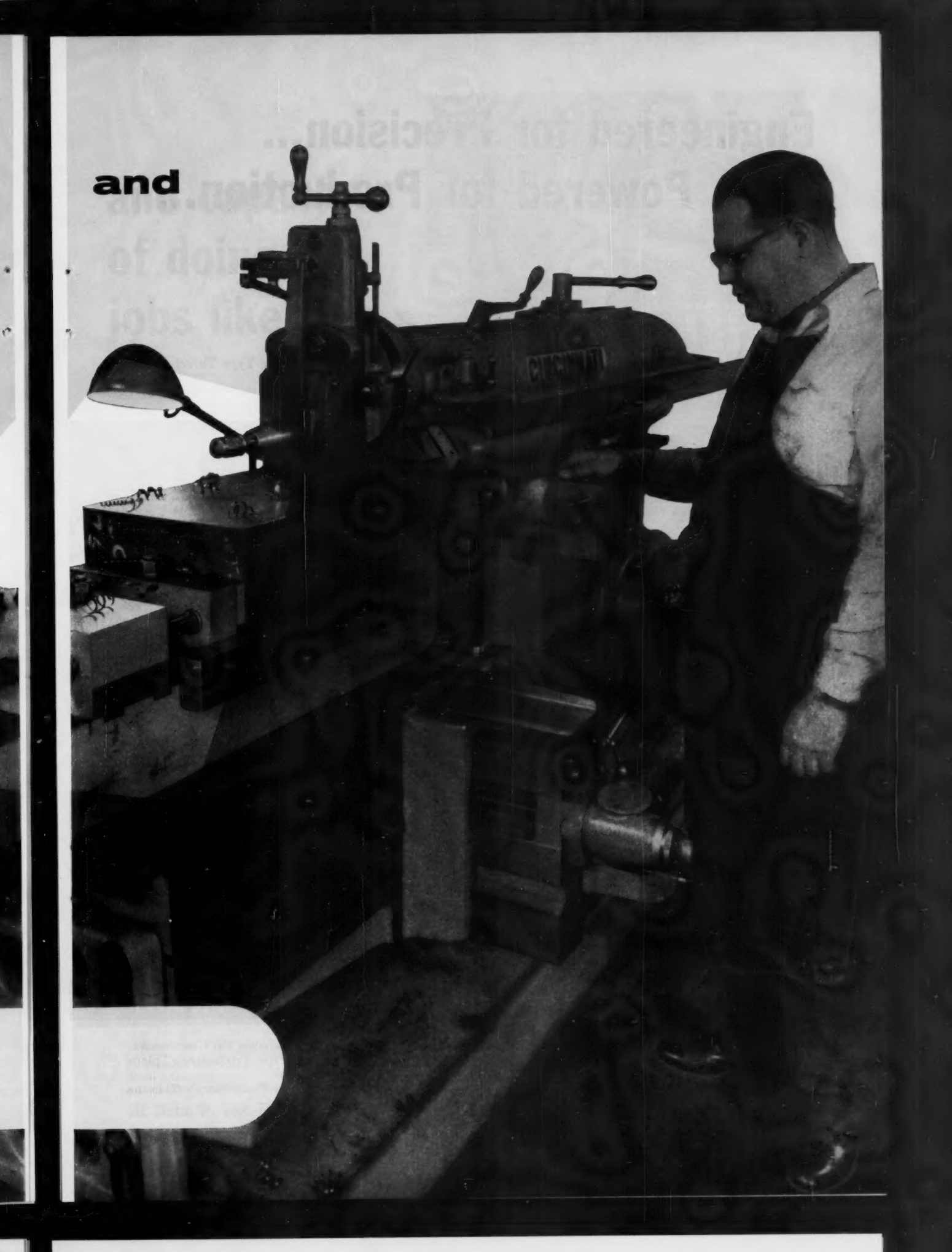
Photo courtesy Drop Dies and Forging Company, Cleveland, Ohio.



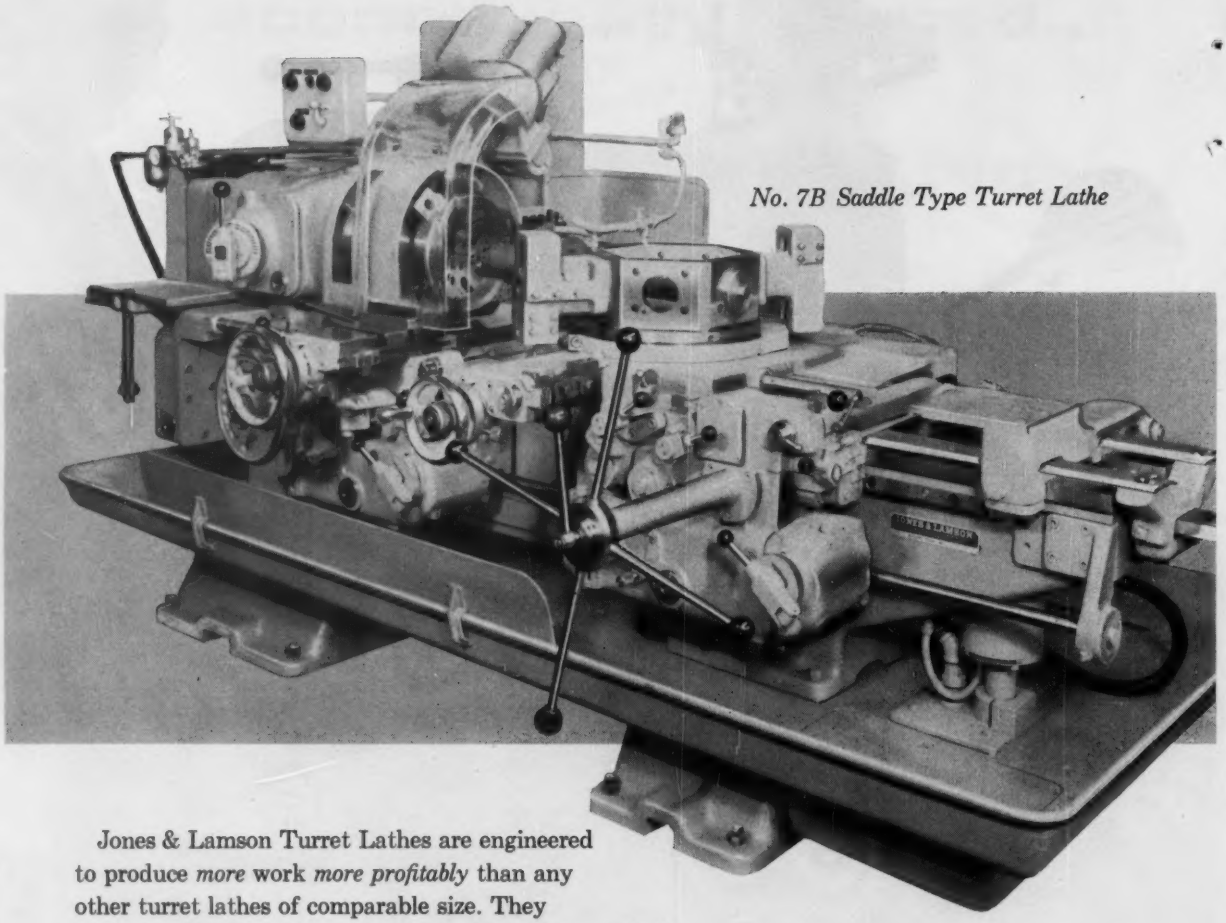
CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES


and

Engineered for Precision... Powered for Production...



No. 7B Saddle Type Turret Lathe

Jones & Lamson Turret Lathes are engineered to produce *more* work *more profitably* than any other turret lathes of comparable size. They have the rugged, rigid construction that makes possible greater accuracy and the use of Hi-Velocity turning; and they incorporate many superior features that assure PRODUCTIVE CAPACITY unmatched in its class. Adequate spindle speeds and horsepower insure the proper use of carbide cutting tools at surface speeds of 650-750 feet per minute.

J&L JONES & LAMSON MACHINE COMPANY

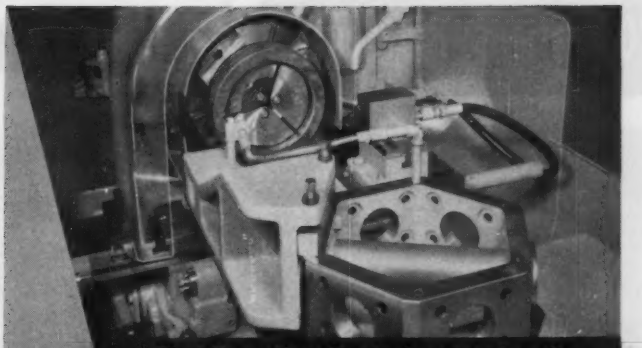
Jones & Lamson offers you a choice of methods for acquiring modern, profit-producing J & L equipment. In addition to outright purchase, J & L makes available several different "Pay-From-Productivity" plans at interest rates of 3¼% and lower (add-on), and a broad variety of lease plans.

Send today for complete details on J & L's machines, methods and Procurement Plans. Simply fill in the coupon, clip it to your letterhead and mail.

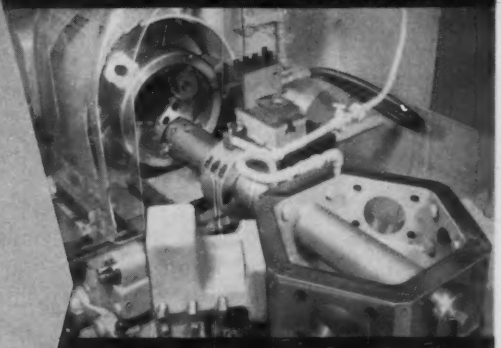
and capable of doing jobs like this...

Machine tools do not pay dividends unless they are cutting metal. Engineering the tooling around the parts to be produced reduces the setup time to a minimum, and in many cases doubles the production per labor hour.

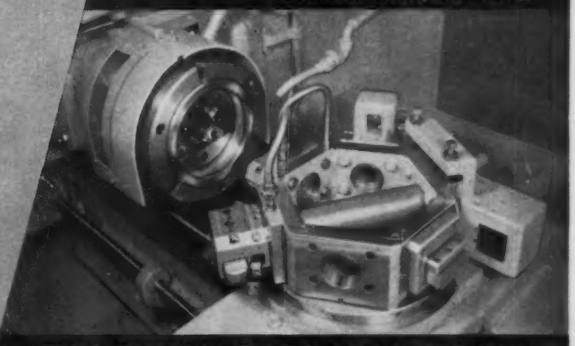
In this case high production methods of tooling for automatic lathes were simplified and applied to three 7B J&L Universal Saddle Type Turret Lathes. Inner and Outer Ball Bearing Races and Roller Bearing Races are produced on the same machines. Setup time from one lot to the next does not exceed fifteen to twenty minutes per machine.



First Operation: One tool mounted on the Hex Turret turns the O.D. while a tool mounted on the rear of the cross slide faces one end. At the end of the facing cut, the radius on the O.D. is formed. Floor-to-floor, 1.94 min.



Second Operation: Location is taken from the two previous finished surfaces. Boring and I.D. chamfering are performed by using tools mounted on the Hex Turret while facing and forming of the O.D. are finished by tools mounted on the rear of the cross slide. Floor-to-floor, 2.57 min.



Third Operation: Special wrap-around jaws mounted on a power operated three-jaw scroll chuck are used for holding the finish turned ring when grooving. The groove is formed by a radius tool held in a bar mounted on the Hex Turret (this applies to internal or external straight or taper races). I.D. is also chamfered in this operation. Floor-to-floor, 1.67 min.

MACHINE TOOL DIVISION

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES • AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES • AUTOMATIC THREAD & FORM GRINDERS • OPTICAL COMPARATORS AUTOMATIC OPENING THREADING DIES & CHASERS

512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

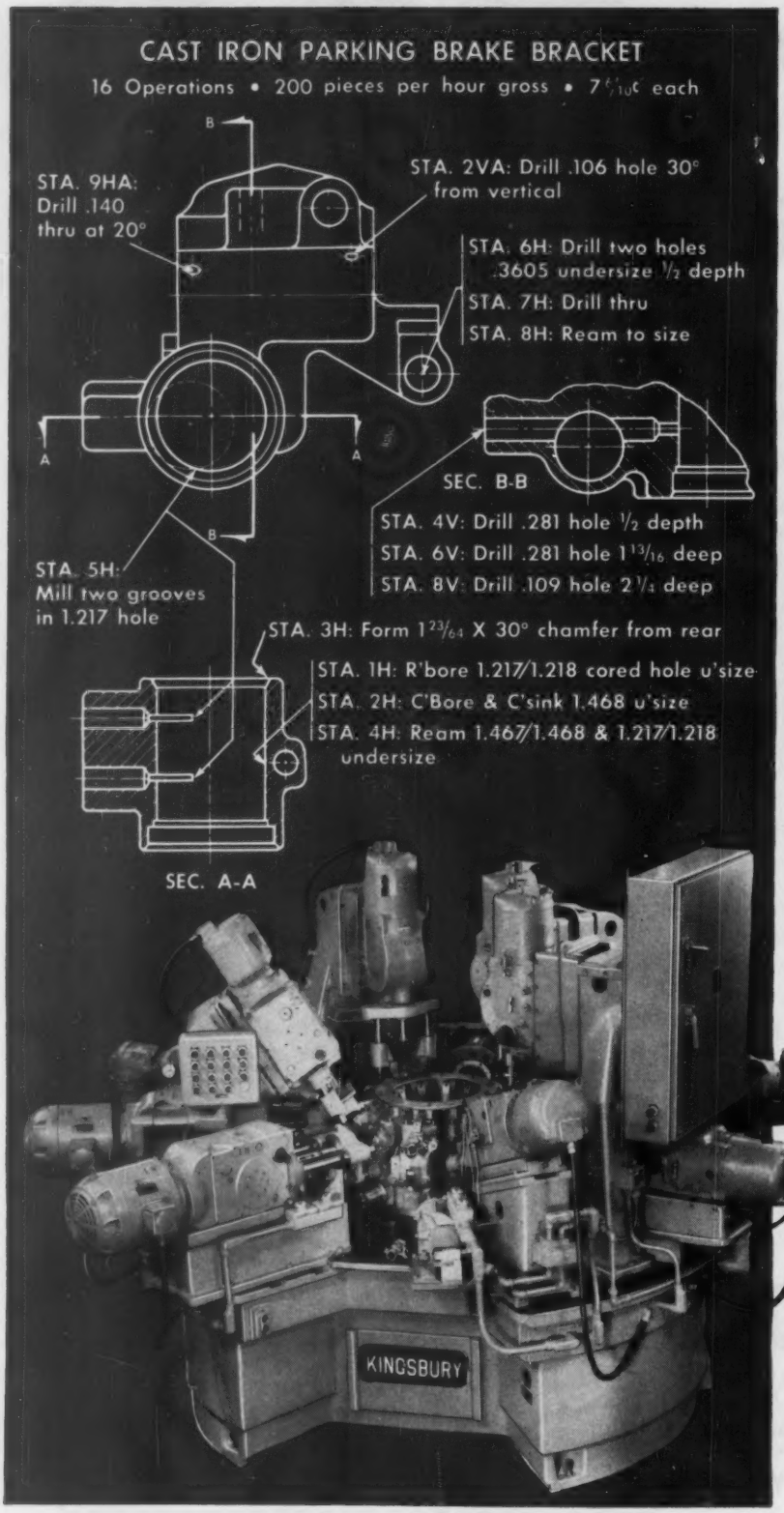
Jones & Lamson Machine Company
512 Clinton St., Dept. 710, Springfield, Vt., U. S. A.

Please send me the J & L Machine Tool Replacement Information Kit.

*Name*_____

*Title*_____

"Operations Kingsbury" can mean greater production

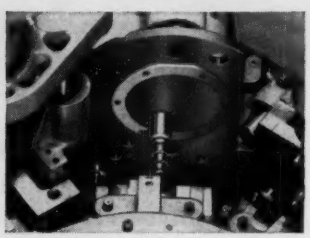

CAST IRON PARKING BRAKE BRACKET
16 Operations • 200 pieces per hour gross • 7 9/10¢ each
STA. 9HA: Drill .140 thru at 20°
STA. 2VA: Drill .106 hole 30° from vertical
STA. 6H: Drill two holes .3605 undersize ½ depth
STA. 7H: Drill thru
STA. 8H: Ream to size
SEC. B-B
STA. 4V: Drill .281 hole ½ depth
STA. 6V: Drill .281 hole 1 13/16 deep
STA. 8V: Drill .109 hole 2 ½ deep
STA. 5H: Mill two grooves in 1.217 hole
STA. 3H: Form 1 23/64 X 30° chamfer from rear
STA. 1H: R'bore 1.217/1.218 cored hole u'size
STA. 2H: C'Bore & C'sink 1.468 u'size
STA. 4H: Ream 1.467/1.468 & 1.217/1.218 undersize
SEC. A-A
KINGSBURY

This Kingsbury Machine has change-over features which enable the customer to go into production with any one of *four* different brake bracket bodies. Selector switch buttons for each Kingsbury head, and simple tool settings are all the adjustments needed.

Prints called for certain machining operations which also presented interesting problems. One of these, requiring twin slots or grooves within the arc of the cylinder, is illustrated and described below. Another employs a Kingsbury-designed recessing tool at Station 3 to form a 30° chamfer at the rear of the cylinder . . .

Altogether, there are 16 operations on the part shown here: eight drilling, three reaming, two boring, two milling and one chamfering — a total of 3,200 operations per hour gross for low-cost, high production — on any one of four models.

Carburetor bodies, also, must be interchangeable throughout. The one on the right is. In the



Section A-A at left shows the tool diameter and location of two grooves or slots milled in the arc of the cylinder wall and connecting with two ports. The operation is performed at Station 5. A horizontal unit with a special head advances the tool into the bore, feeds the twin-milling cutters with an oscillating motion and withdraws the tool — all within the machine time-cycle of 18 seconds.

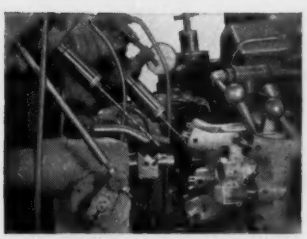
and model changeover savings for you . . .

brief interval it spends in the Kingsbury machine, it is worked upon at 11 stations where 12 operations are performed. One of these involves an interesting bushing mechanism illustrated and described below.

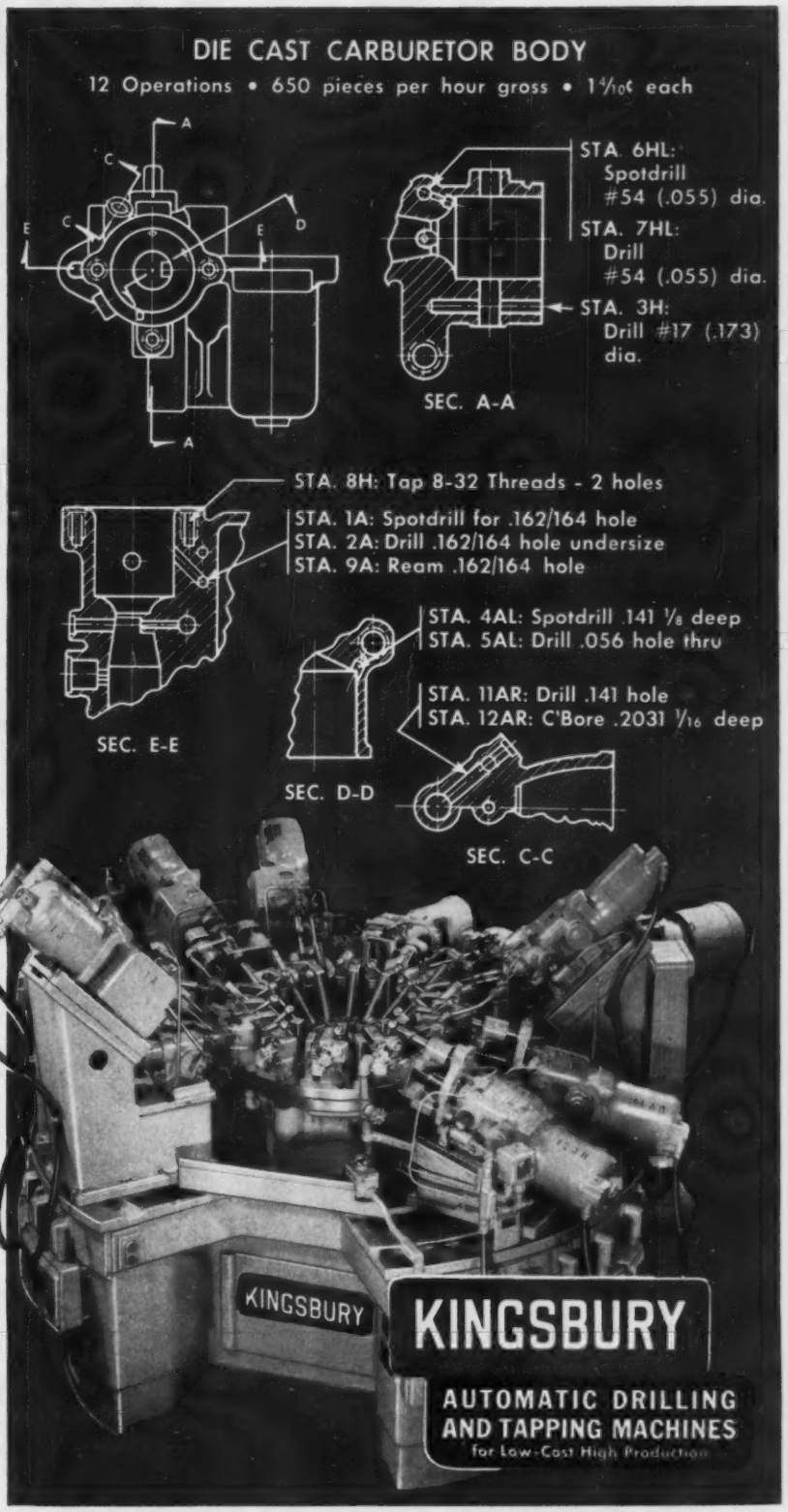
★ ★

There's something quite *sure* about a Kingsbury. It's more than dependable heads, index mechanism, synchronized safety control system, cutting tool guide methods . . . a combination of all these, with work-holding fixtures specially designed and built for each part . . . by men who know how and like the challenge of this work. With more than 5,000 successful Kingsburys behind us you can feel quite sure that if we feel it's a Kingsbury job, a Kingsbury machine will do it well.

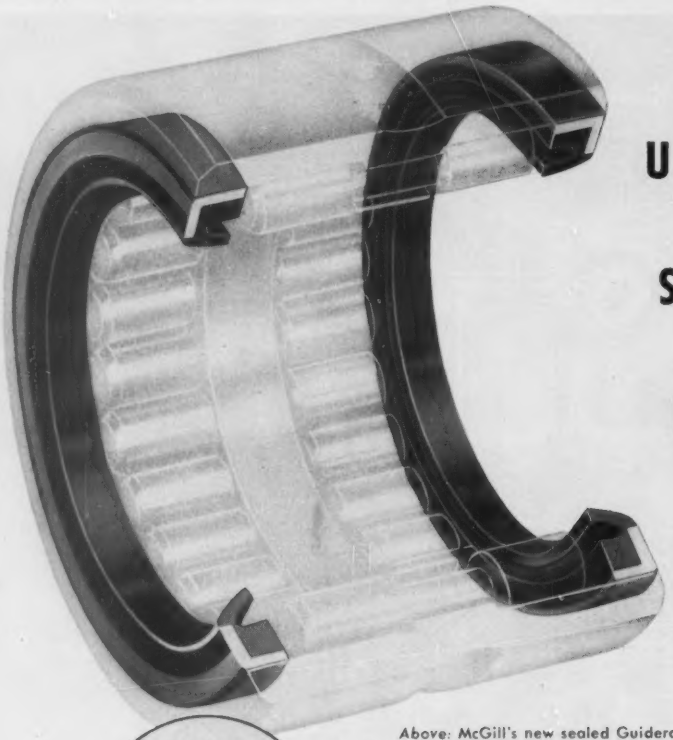
Kingsbury Machine Tool Corp.
109 Laurel Street, Keene, N. H.



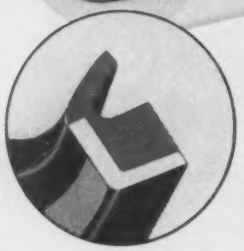
Section E-E at right shows location of a hole reamed .162/.164 at an angle of 45° with the inner bore of a larger hole. The operation is performed at Station 1 where a cam-controlled horizontal plug-type bushing carrier places an angular tool guide bushing inside the bore for the ⅜ spot drill. All this is accomplished in about four seconds!



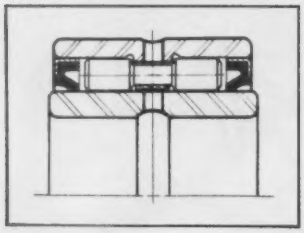
KLOZURE* OIL SEALS



USED IN THE FIRST SEALED FULL TYPE ROLLER BEARING



Above: McGill's new sealed Guiderol** bearing with two *built-in* springless KLOZURES, Model 71-A. *Left:* The Model 71-A has a narrow cross section consisting of a molded synthetic rubber sealing member securely bonded to and integral with a metal case.



Two springless KLOZURES, lips turned in, on Guiderol bearing provide lifetime retention of lubricant. For relubricating at high pressures other sealing arrangements (with lips turned out; with one lip in and one out; and single seals) are available with these bearings.

In developing their new sealed Guiderol bearing, the designers of McGill Manufacturing Co., Inc., (Valparaiso, Ind.) required a dependable grease seal which could be built into the unit *without* increasing the overall bearing size.

Springless KLOZURE Model 71-A proved to be the answer! For here was a proven grease seal of narrow cross section specifically designed for limited space applications. Here, also, was a trouble-free seal which would keep out dust and retain the lubricant for the *life of the bearing.*

There's a service tested KLOZURE model for every bearing application. Let us show you how Garlock KLOZURES can solve your sealing problems. Just call the Garlock office nearest you or write for KLOZURE Catalog 10.

*Registered Trademark

**Trademark of the McGill Manufacturing Co., Inc.

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago Cincinnati • Cleveland • Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia • Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

For more information on products advertised, use Inquiry Card, page 257

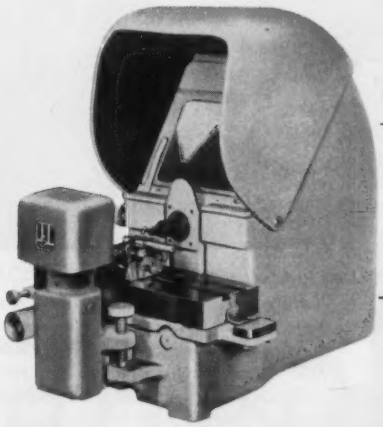
HOW TO "GUARANTEE GUARANTEE"

Every set of Jones & Lamson Die Head chasers carries this full guarantee: *to produce Class III threads, or better, across the board.* To insure this guarantee, and to keep manufacturing costs down, J&L carries on successive interoperation inspections the positive way, with Jones & Lamson Optical Comparators.

(We practice what we preach)

Avoid costly work on scrap—
Prove machining results before subsequent operations

Controlled quality means lower costs. Use J&L Comparators on *your* production line . . . their versatility is unlimited.



Write Dept. 710 for information on Comparators and/or Jones & Lamson Thread Tool Products.

FIFTEEN

Dovetails of chasers are straddle milled. Tolerances checked on
The J&L OPTICAL COMPARATOR

Mill angle on front end of chaser. Length and angle checked on
The J&L OPTICAL COMPARATOR

Dovetail angle milled. Angle and centerline checked on
The J&L OPTICAL COMPARATOR

Ratchets for spacing are milled. Chaser length, ratchet form and spacing checked on
The J&L OPTICAL COMPARATOR

Back chamfer is milled. Angle and flat checked on
The J&L OPTICAL COMPARATOR

After heat treating, dovetail is ground. Angles, flats and depth inspected on
The J&L OPTICAL COMPARATOR

Grind thread form. Thread form, angles, root, crests, spacing, lead and helix checked on
The J&L OPTICAL COMPARATOR

Chamfer ground as specified. Angle and amount below root checked on
The J&L OPTICAL COMPARATOR

Top rake ground. End grind and point height checked on
The J&L OPTICAL COMPARATOR

JONES & LAMSON

World's largest manufacturer of Optical Comparators since 1919

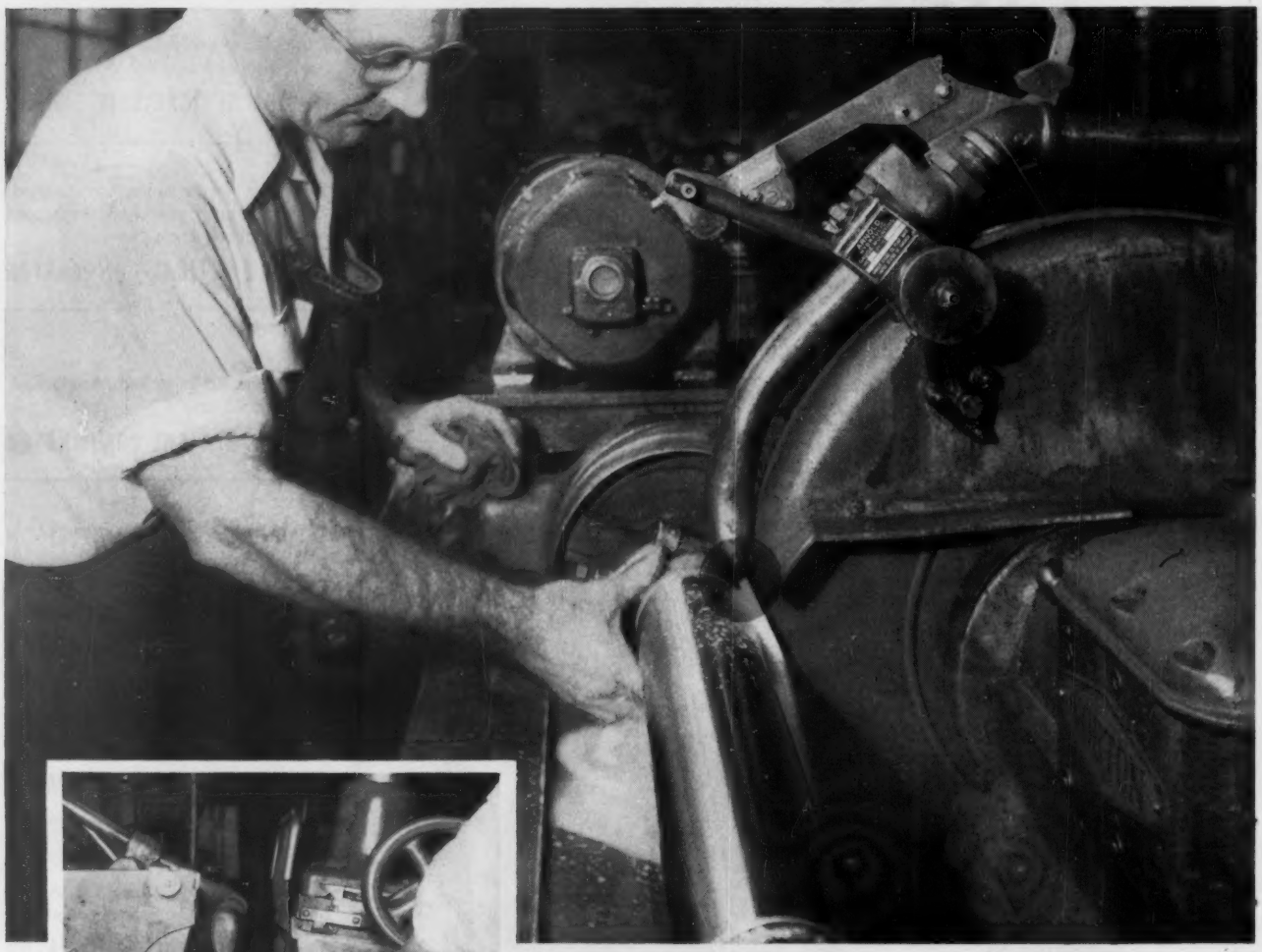
JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

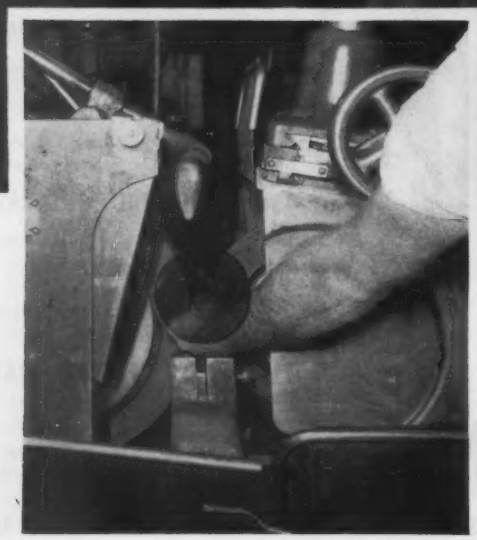
OPTICAL COMPARATOR DIV.

For more information on products advertised, use Inquiry Card, page 257

On-the-job photos . . . on-the-job facts . . . show

Norton G Bond wheels setting new economy records in O. D. grinding





"***Production rate increased 35%*** by G Bond wheels, with a greatly improved finish," are two typical "Touch of Gold" advantages reported by the user performing this cylindrical grinding operation. Job calls for .025" stock removal from 1040 seamless steel tubing, with ⅛" wall. The machine is a Norton — a reminder that only Norton offers you such long experience in both grinding machines and wheels, to help you produce more at lower cost.

"***We now get 800 pieces per dress*** with Norton G Bond wheels, as against 500 pieces with previous wheels. Also, we get 50% more wheel life, a better finish, and the shoulder holds up much better." Those are the facts reported on this plunge-cut centerless grinding job. Work is a ¼" diameter x 1" long stud from which .012" stock is removed, to .0005" tolerance and 20 microinch finish.

Users tell how "TOUCH of GOLD" *performance boosts production rate, product quality and profits*

In many years, nothing has done as much to raise the standards of precision and semi-precision grinding as Norton G Bond wheels. In the field of O. D. grinding, for example, users all over the country report that these greatly advanced wheels have given them an entirely new slant on the profit-possibilities of their centerless and cylindrical grinding jobs.

Here we can illustrate and quote only a bare minimum of the very many enthusiastic endorsements that are pouring in. But you could sum them all up in this sentence: "G Bond wheels grind faster, finish better, last longer and save us money on every job."

The reason is, the Norton G Bond is by far the most efficient vitrified bond ever developed. Wheels made with it outperform all others of this type, with "Touch of Gold" advantages like these:

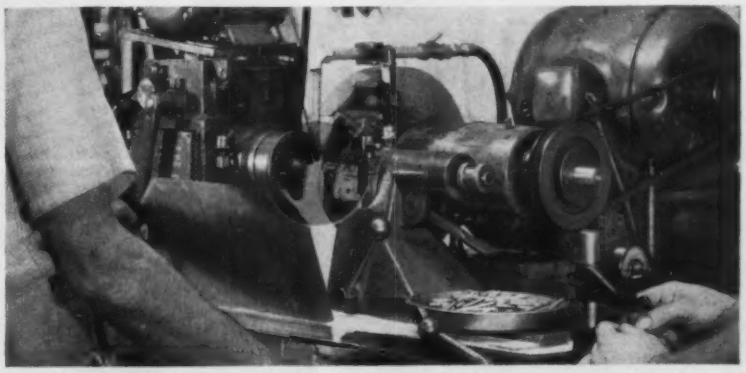
Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on crushing roll.

See your Norton distributor

for proof of how G Bond wheels can help improve your products and cut your production costs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products... to make your products better

"***G Bond wheels last up to 40% longer,***" reports this centerless grinding customer. The piece is a vanadium alloy steel spindle ¼" diameter x 10" long, with a tapered shank — ground in a plunge cut which removes an average of .045". With G Bond they found that wheel life increased 30% to 40% because this greatly improved vitrified bond breaks down evenly.



"***100% better finish***" is just one of the advantages listed by this user who switched to G Bond wheels for cylindrical grinding of small diameter stock. And besides improvement in product quality, this firm reports 50% more pieces per dress, with the last piece ground before dressing showing every bit as good a finish as the first piece ground after dress — additional G Bond benefits adding up to "Touch of Gold" performance.

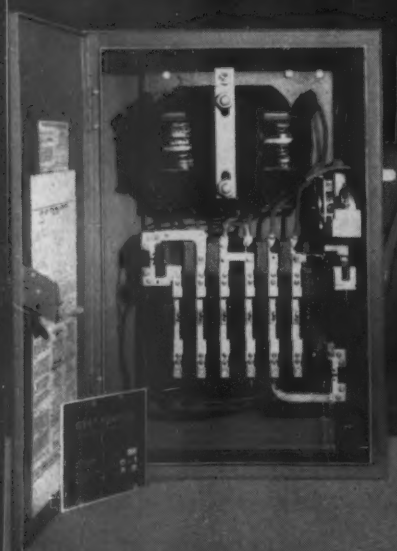
W-1606

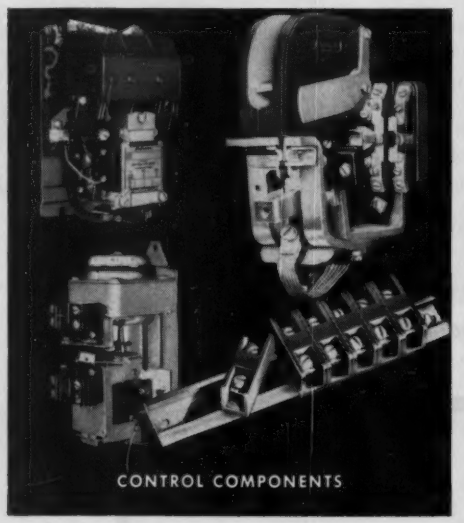
NORTON

and its BEHR-MANNING division

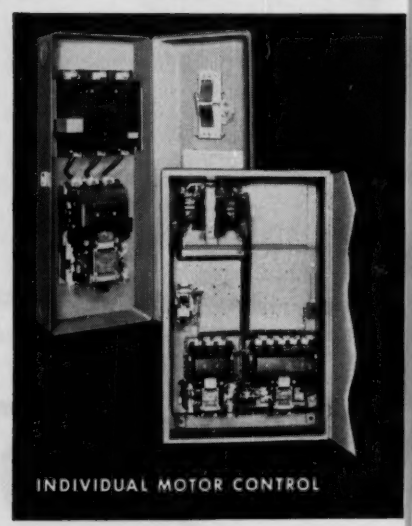
NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

MOTOR CONTROL FACTS ON
INDUSTRY'S MOST COMPLETE LINE





CONTROL COMPONENTS



INDIVIDUAL MOTOR CONTROL

FACT:

The only manual reduced voltage starter with air break contacts in all ratings

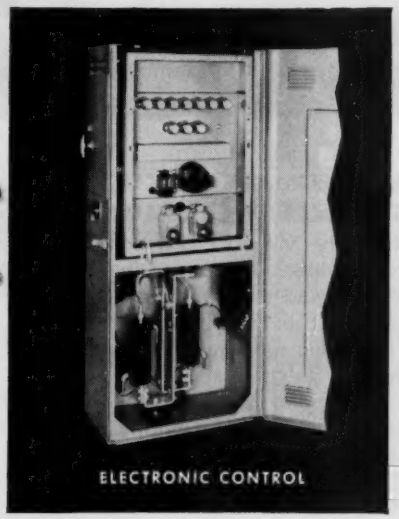
The new Westinghouse Type MB autostarter with air break double contacts eliminates the costly "oil problems" of contamination, oil level checks, spilling and messy leaking. This combined with timed acceleration makes it industry's most advanced reduced voltage starter.

Such product design advances are just part of the total advantages you gain with Westinghouse motor control. *Whatever your control problem* —from the simplest control component to complete automation—it can be solved all from *one* source—*one* responsibility.

For *all* the facts on Westinghouse motor control, call your Westinghouse sales engineer . . . *The Man With The Facts!* J-21872

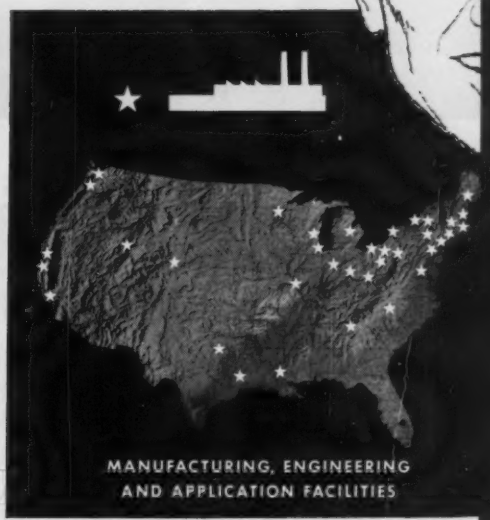
YOU CAN BE SURE... IF IT'S

Westinghouse



ELECTRONIC CONTROL

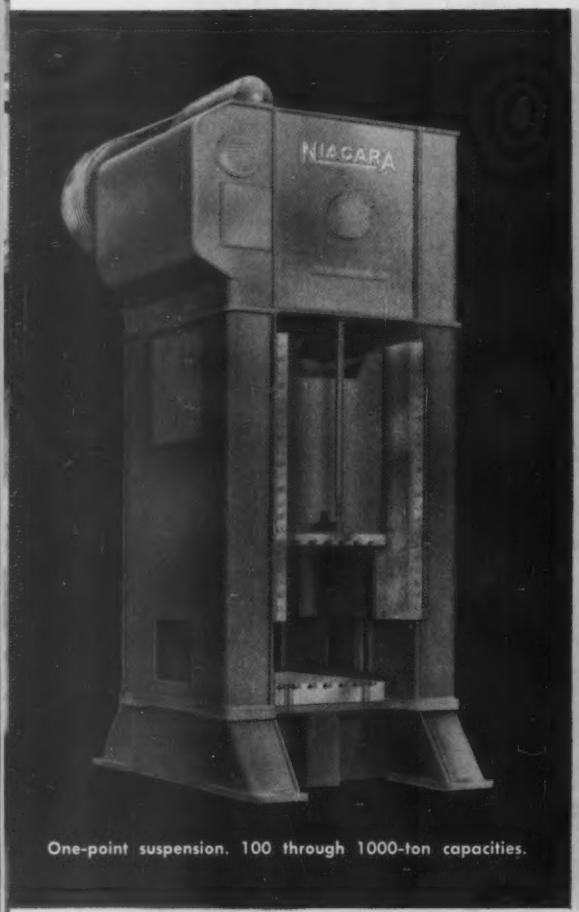
CONTROL SYSTEMS



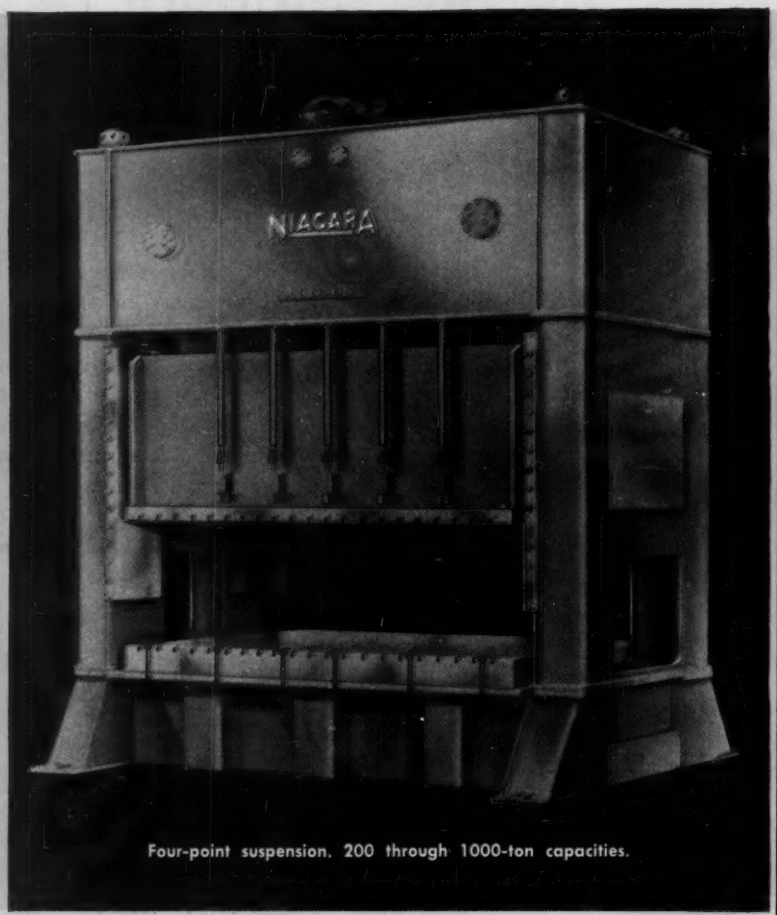
MANUFACTURING, ENGINEERING AND APPLICATION FACILITIES

NEW! MASTERFULLY ENGINEERED

excels in large, heavy tonnage



One-point suspension. 100 through 1000-ton capacities.



Four-point suspension. 200 through 1000-ton capacities.

ECCENTRIC DRIVE DELIVERS GREATER TORQUE WITH LESS DEFLECTION

In Niagara Series SE Presses, the eccentric is an integral part of the main gear (or gears) which rotates on a stationary pin rigidly supported in the crown, close to the point at which the pressure is exerted. Serving merely as a pivot, the pin carries no torsional load and relatively little bending load. Net result: Niagara's eccentric gear design can deliver greater torque with less deflection than other types of construction.

RUGGED, RIGID, ALL-STEEL FRAMES PROVIDE GREATER ACCURACY, LONGER DIE LIFE

Frames are rugged, all-steel, four-piece, tie-rod construction of great strength and rigidity, stress relieved in a furnace and thoroughly grit-blasted before machining. Each frame size has been scientifically tested for deflection to meet Niagara standards — the most exacting in the industry.

LOW INERTIA, PNEUMATIC FRICTION CLUTCH RUNS COOLER, WEARS LONGER

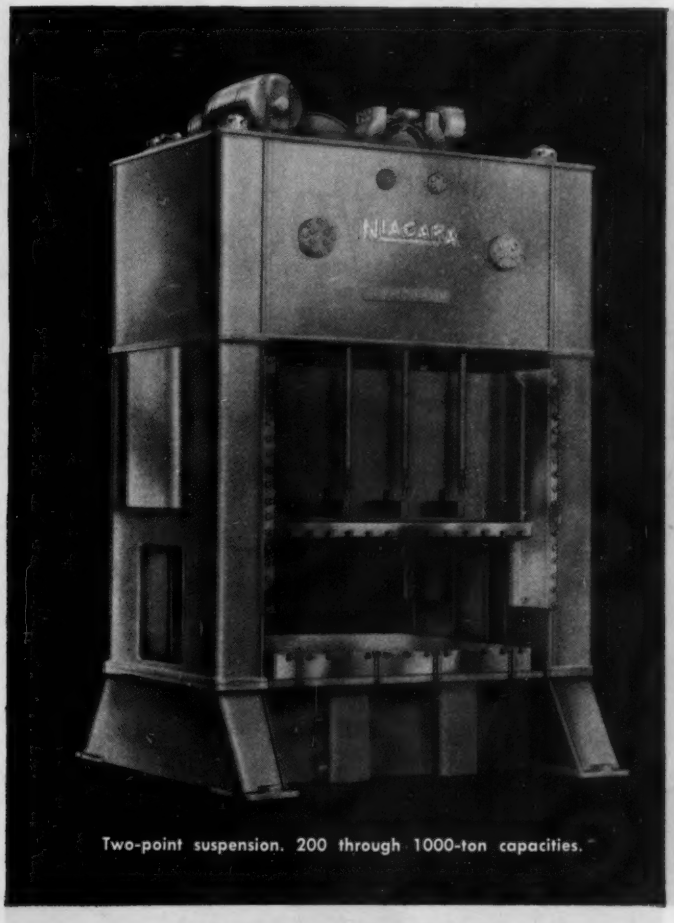
Most of the weight of the Niagara clutch continues to rotate with the flywheel. Only the drive shaft and driving plate start and stop with each cycle. The resulting low weight and inertia of the parts, picked up during clutch engagement, greatly reduce heat and wear. As the clutch rotates, it acts as a centrifugal blower, providing positive ventilation. Plates automatically compensate for normal wear, with no adjustment necessary.

MODERN, STREAMLINED DESIGN EMPHASIZES COMPACTNESS

The entire driving assembly is neatly housed in the crown. There is no exposed, overhanging flywheel, clutch, brake, shaft nor motor in the rear of the press to obstruct crane service, block light, throw grease or consume space unnecessarily.

LINE OF METALWORKING CHAMPIONS

drawing, punching and blanking work



Two-point suspension. 200 through 1000-ton capacities.

Without equal in engineering design, performance and stamina, this great new line of Niagara Straight Side Eccentric Geared Presses is every inch a champion. It is an outstanding example of the advanced thinking that has made Niagara the pace-setter among builders of metal working machines for 75 years.

Masterfully engineered and ruggedly constructed to handle a tremendous variety of work, the new Niagara SE Series is the most practical and dependable press line built for:

- Work requiring large die areas.
- Heavy tonnage demands.
- Long stroke, deep drawing jobs where work is engaged high up on the stroke.
- Bottom-of-stroke blanking and punching.

THE COMPLETE STORY IS READY FOR YOU NOW!
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"L" Type Dial Snap Gage

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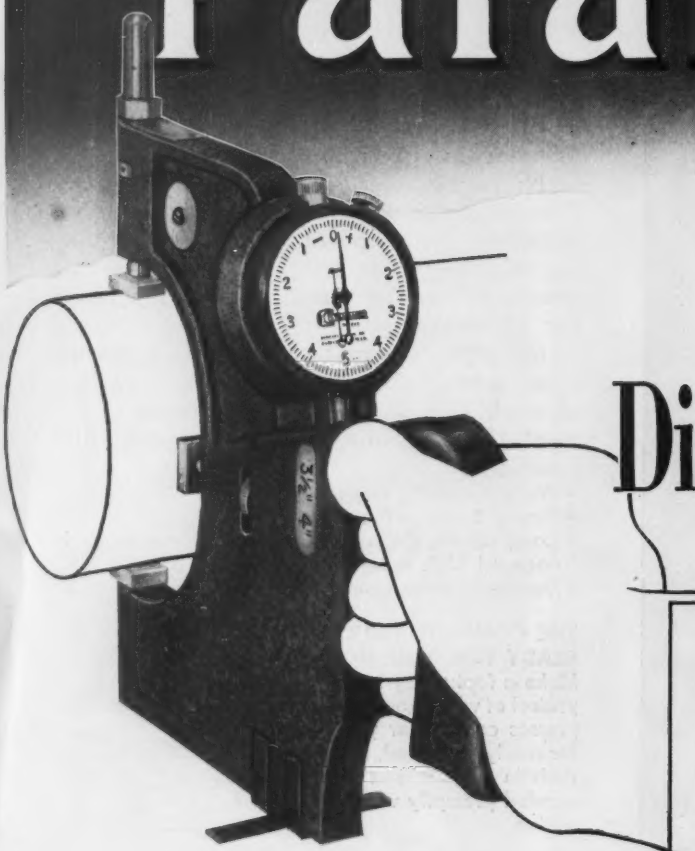

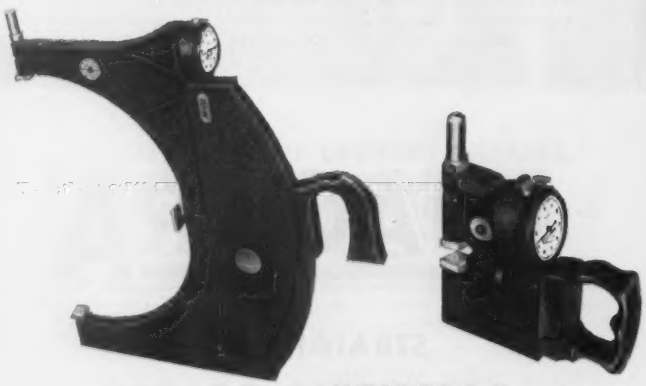

RANGE OF SIZES
14" down to 0"

HERE is a modern, heavy-duty dial snap gage, light in weight, rugged in construction, designed for the toughest of long-run jobs.

The "L" Type utilizes Standard's Paralloc pin locking mechanism, which accurately maintains the parallelism of the anvil faces throughout the range of adjustment to a degree heretofore not available in this type of gage.

Eight sizes cover from 0 to 4 inches, each having ½" range of adjustment. Above 4 and up to 14 inches, each size has 1-inch range. Anvils are faced with tungsten carbide, and backstops are of nylon (except 0" - ½"). User may choose from a variety of indicator sizes and graduations. Retracting levers and tolerance hands are also available.

Write for complete information.

STANDARD GAGE COMPANY, INC.

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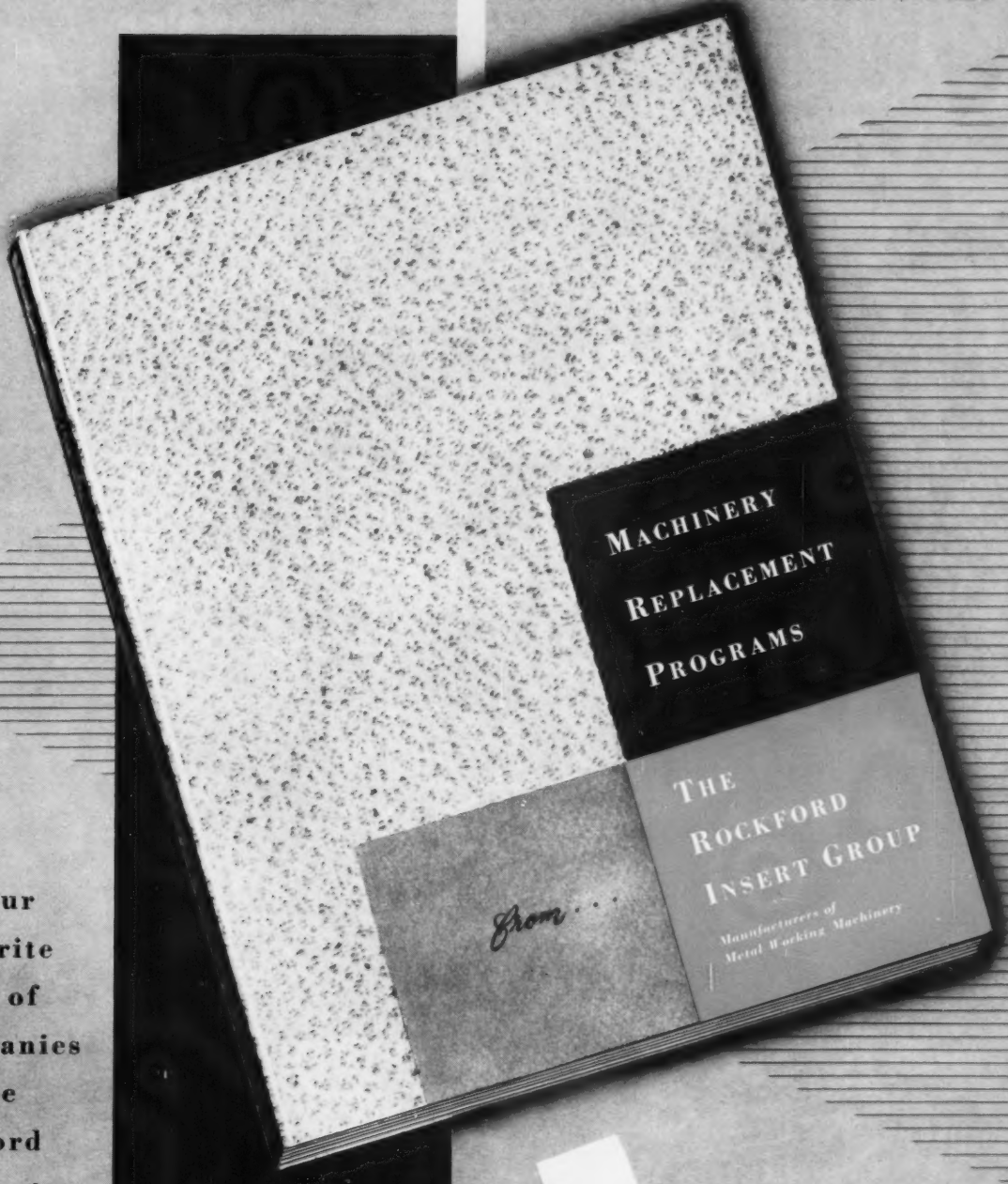
For more information on products advertised, use Inquiry Card, page 257

Up-to-date

information on machinery replacement programs from some of America's foremost industrial firms



for your copy write to any of the companies in the Rockford Insert Group

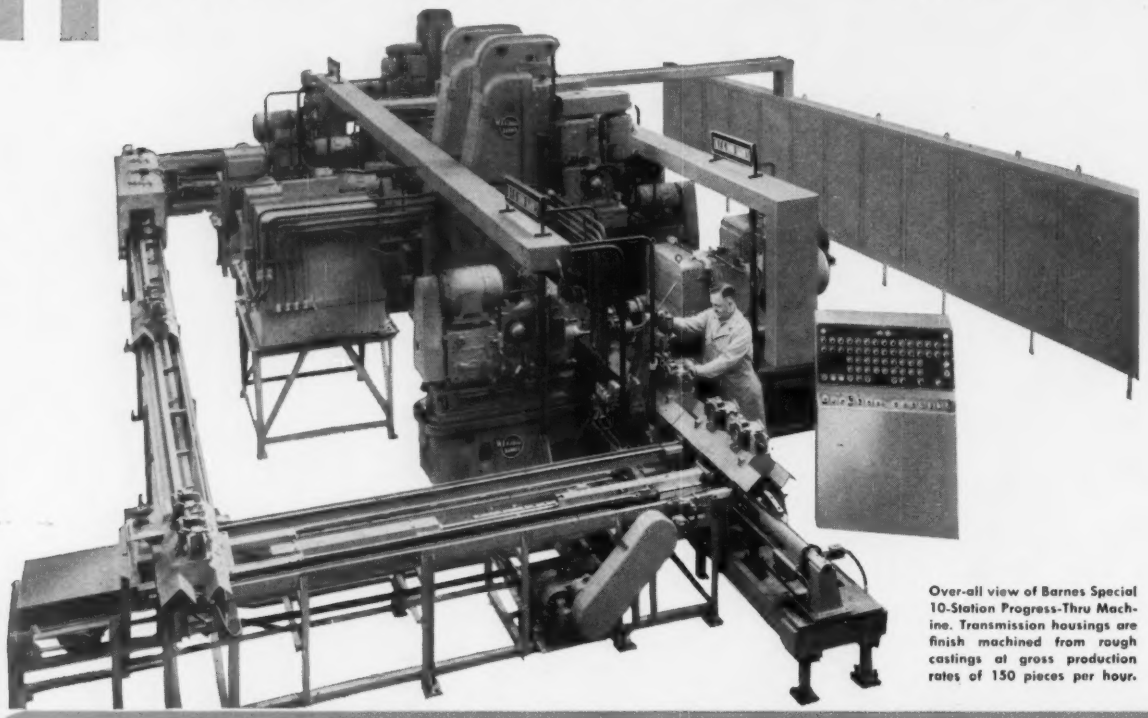
April, 1955

ROCKFORD INSERT GROUP

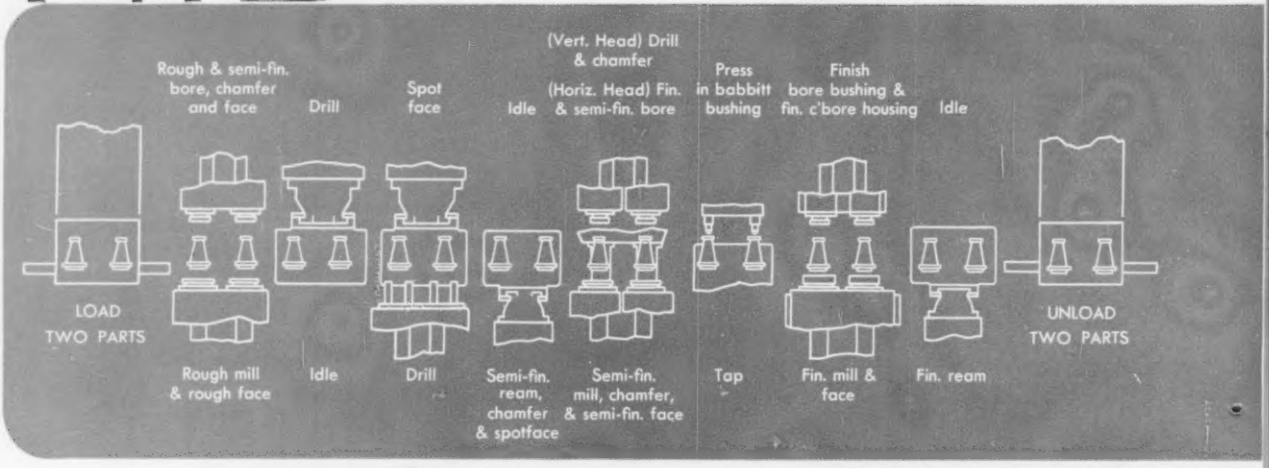
Keep gathering metal-working production ideas . . . be well informed when the time for replacement arrives

TRANSMISSION EXTENSION

HOUSINGS NOW MACHINED COMPLETE



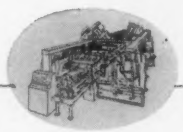
Over-all view of Barnes Special 10-Station Progress-Thru Machine. Transmission housings are finish machined from rough castings at gross production rates of 150 pieces per hour.



▲ Schematic drawing of machining operations. Total concentricity on all operations does not exceed .002". Housings are held in transfer plates which are located by two hydraulically actuated dowels and clamped hydraulically at each machining station.

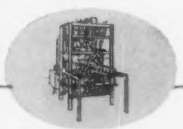
Builders of Better Machines Since 1872

W. F. & JOHN BARNES



Special Machine Tools

Special Conveyor Units

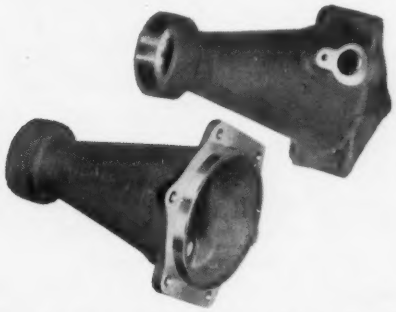


Special Process Equipment

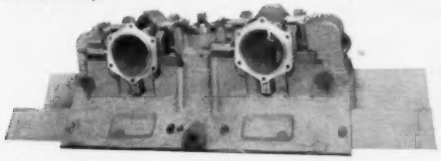
MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

FROM ROUGH CASTING TO FINISHED PART



Transmission extension housings are finish machined in automatic cycle from rough casting to finished workpiece. After rapid washing and final inspection, the part is ready for assembly.



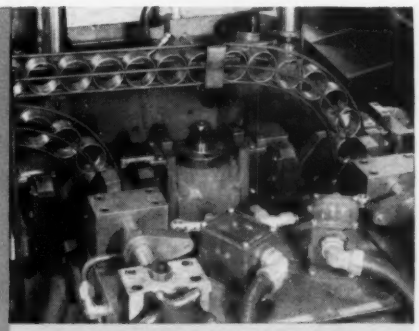
View of workpieces in special transfer plate fixture. Both housings are located and accurately positioned by means of dowels and screw-operated V-block clamps.

ON

W. F. & JOHN BARNES SPECIAL 10-STATION PROGRESS-THRU MACHINE

Here is another typical example of how W. F. & John Barnes Six-Point Machine Tool Building Service has helped increase production efficiency for a leading automobile manufacturer. All machining operations on transmission extension housings are now combined in one Special Barnes 10-Station Progress-Thru Machine at a production rate of 150 pieces per hour. Two operators, one at the loading end and the second at the unloading end, load and unload housings on transfer plates which carry workpieces through the entire machining cycle. Operations include boring, facing, milling, drilling, reaming, automatic press-in of babbitt bushings, and combination finish bore babbitt bushing and finish counterbore housing.

Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Closeup of station seven where babbitt bushings are automatically pressed-in to the small end of the housings. Bushings are hopper loaded by operator at the unloading station.

BARNES' COORDINATED 6-POINT MACHINE TOOL BUILDING SERVICE INCLUDES:

1. **SPECIALIZED MANUFACTURING FACILITIES** —75-year background, large well equipped plant efficiently tooled to build high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
4. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operations at high production speeds.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING** —Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

WRITE FOR FREE BOOKLET

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service.

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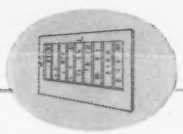
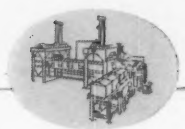


Special Electrical Controls



Food Machinery

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

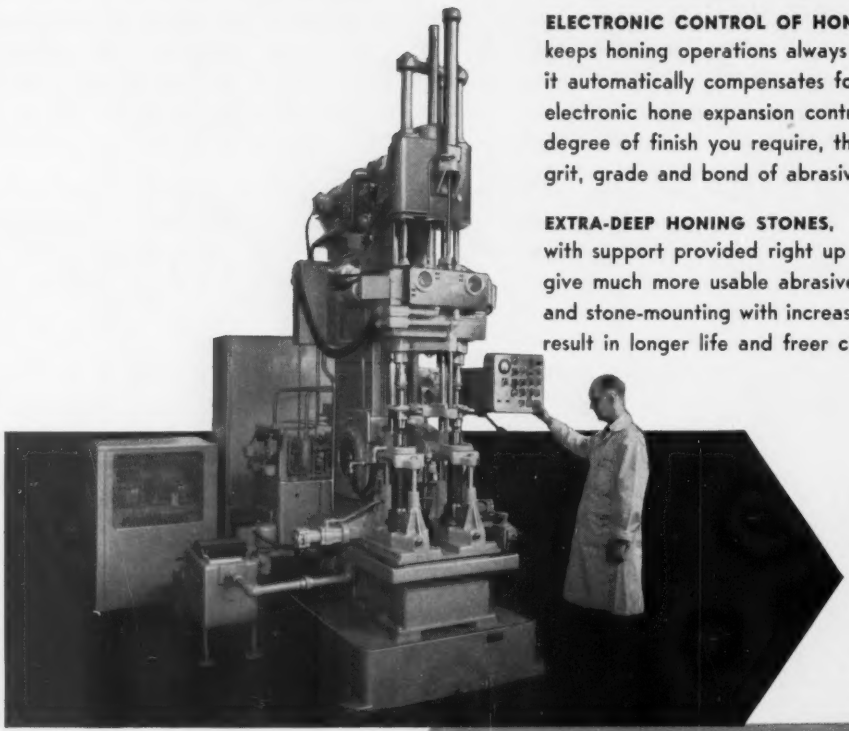
FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

cut *Finishing* costs
THROUGH HIGH PRODUCTION-PRECISION CONTROL
using
BARNESDRIL

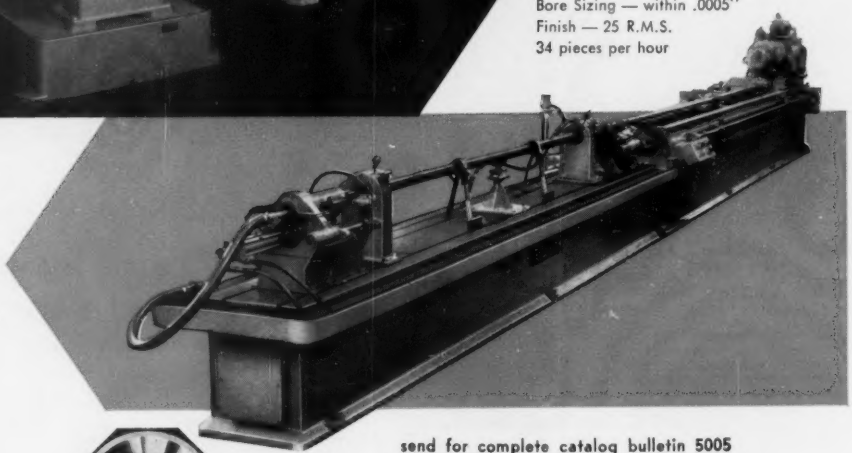
PLUGMATIC SIZING
works automatically to give bore-to-bore size control over every piece honed, making each interchangeable with the others. Sizing is not affected by misalignment or eccentric stone wear.

ELECTRONIC CONTROL OF HONE EXPANSION
keeps honing operations always at peak efficiency because it automatically compensates for stone wear. With electronic hone expansion control, you can select any degree of finish you require, through proper rate of feed, grit, grade and bond of abrasive stone.

EXTRA-DEEP HONING STONES,
with support provided right up to the cutting edge, give much more usable abrasive. Improved body design and stone-mounting with increased cutting edge support, result in longer life and freer cutting action.



No. 307
VERTICAL HONING MACHINE
Job Specifications:
Steel Hydraulic Cylinders
Bore — 3.000" I.D. x 10½" length
.012"/.017" stock removed
Bore Sizing — within .0005"
Finish — 25 R.M.S.
34 pieces per hour



No. 38
HORIZONTAL HONING MACHINE
Job Specifications:
Steel Tubes
Bore — 1.500" I.D. x 10 ft. length
.012"/.016" stock removed
Bore Sizing — within .0005"

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REHNBERG-JACOBSON

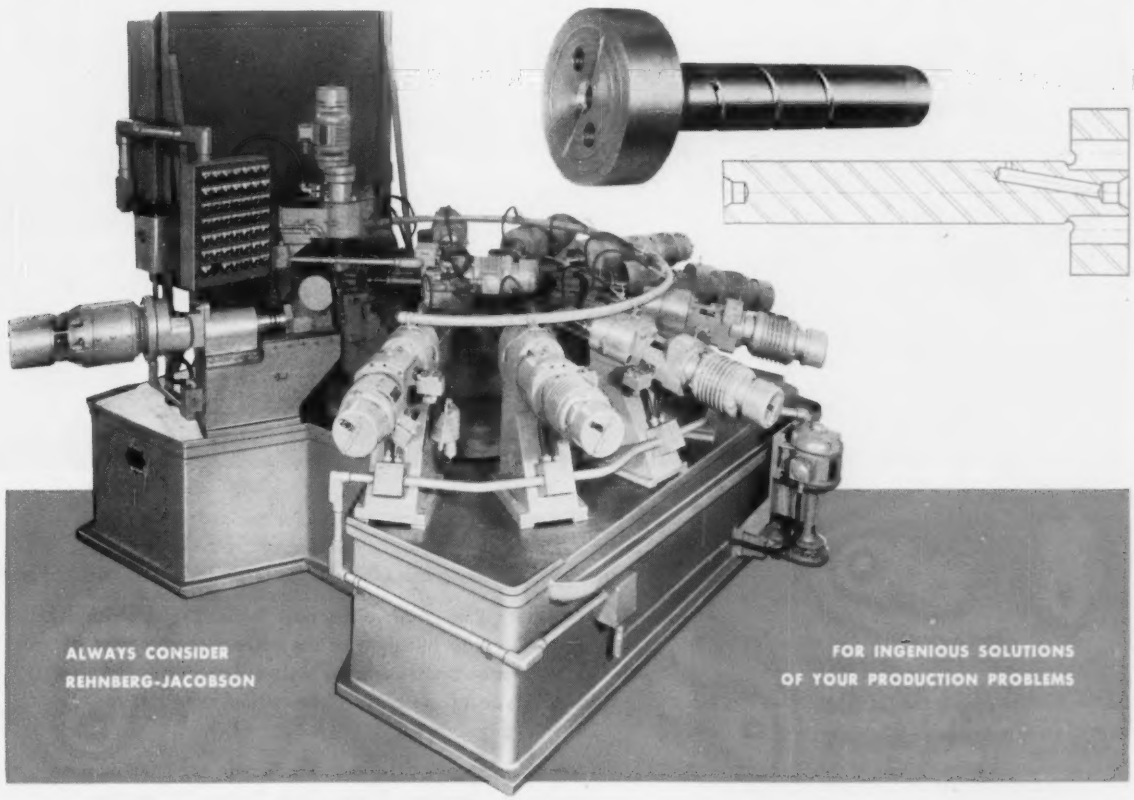
Shows the way to...

DRILL AND REAM SOME "TRICKY" HOLES IN ROTORS FOR FREEZER COMPRESSORS

This 13-station Automatic Index machine speeds up the performing of several operations that are a bit off the beaten track — and, for good measure, a slot-milling operation is thrown in. As can be seen, standard Rehnberg-Jacobson No. 2 and No. 3 Drill Units are correctly placed to handle the operations in proper sequence, including a plunge-milling head, one unit that is vertical, and another in the middle of the Index Unit to center-drill the small end. The net result is a capacity rating of 263 pieces per hour.

ONE MACHINE HANDLES TWO SIZES

The user of this machine makes *two* of these pieces, differing only in thickness of the big end and overall length. However, the adaptation of the machine to handle either one with a minimum of adjustment resulted in the introduction of several ingenious devices. The necessity for such arrangements arose from the existence of a locating step and several bottom drilling and bottom reaming requirements. However, the result is extremely successful and the changeover takes only a very short time — "a few minutes", as they say.



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FOR INGENIOUS SOLUTIONS
OF YOUR PRODUCTION PROBLEMS

Designers and Builders of Special Machinery

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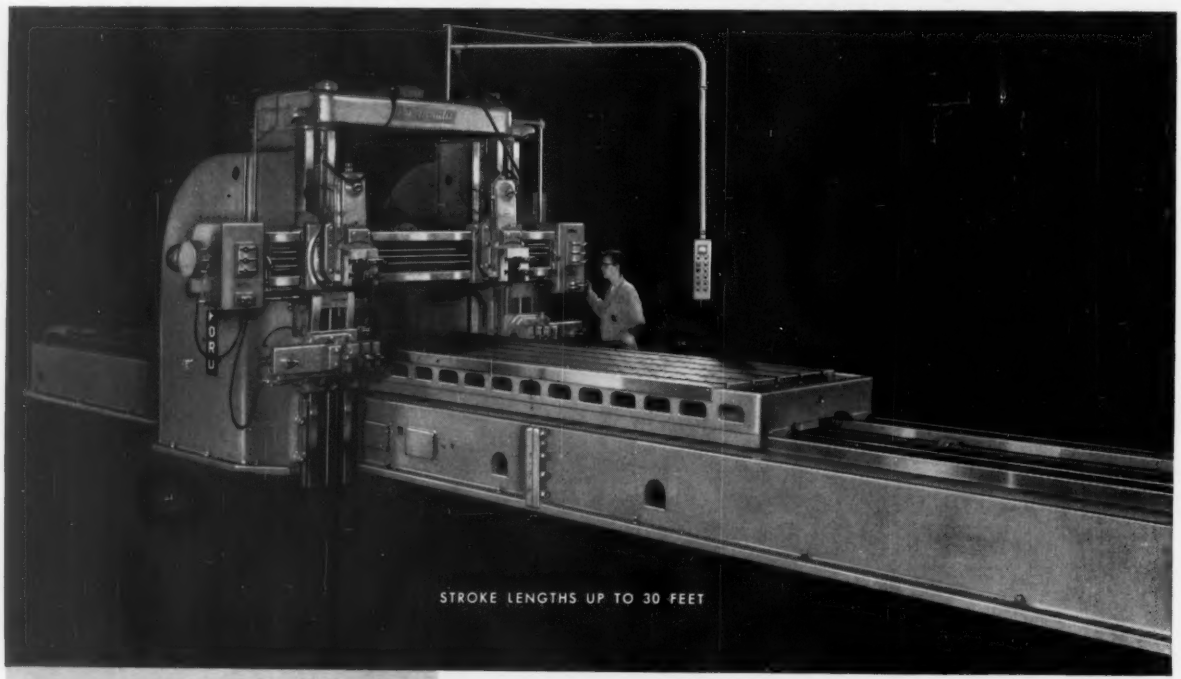
fast, economical production calls for HYDRAULIC

hydraulic planers with exclusive triple circuit HYDRAULIC



Hy-Draulic

Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Planers have the new Triple Circuit which provides easy selection of the correct combination of cutting speed and force to most economically machine every type of material — free-cutting materials to the toughest steels.

When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

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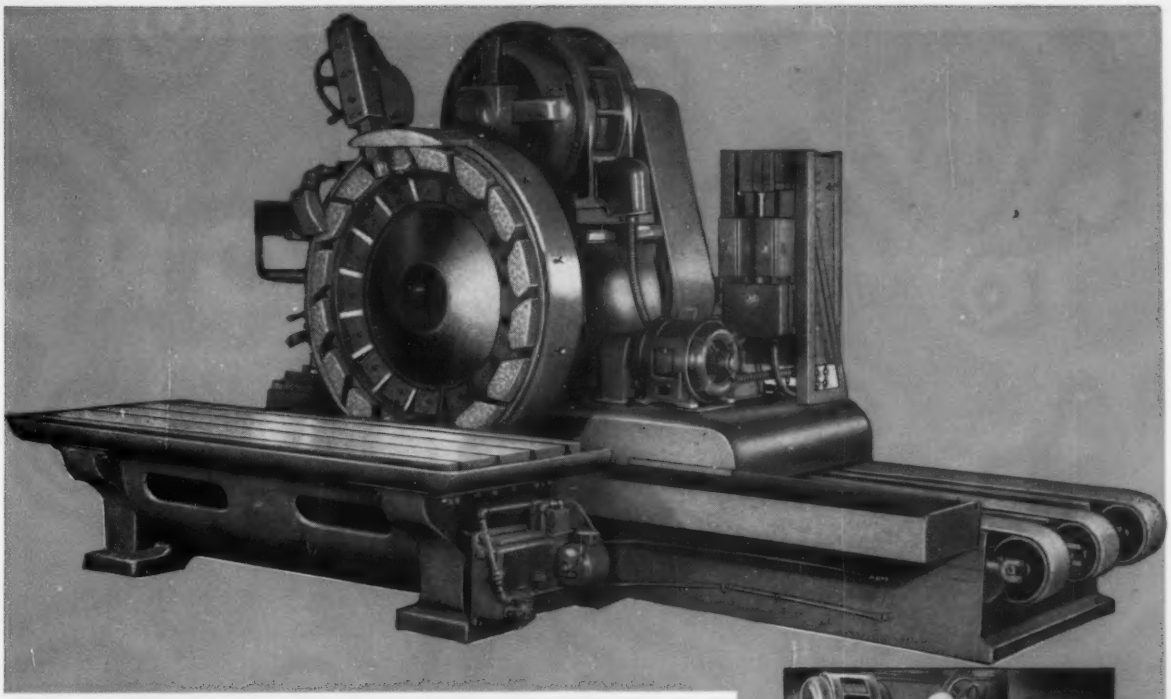
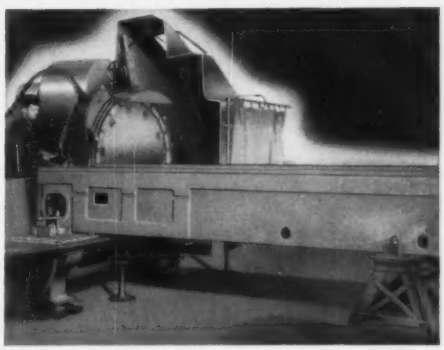


MATTISON TRAVELING WHEEL GRINDER FOR FAST FINISHING OF LONG OR LARGE PARTS

If your work consists of long or bulky parts, Mattison UK Traveling Wheel Grinders will finish them at a surprising rate of speed and accuracy and at very low cost. Large and awkward shaped pieces are frequently ground in a good deal less time than previous method. The part, no matter how large, is clamped in a stationary position and the grinding wheel passes across the surface to be finished. Amount of floor space needed is little more than half that required by traveling table machines of equal capacity. The operator's position on the carriage, together with the convenient grouping of all controls, makes for utmost grinding accuracy and speed regardless of the size of the job.

For further information, send for new free circular No. 844-2 RM covering this machine.

The operator rides the carriage of the UK Traveling Wheel Grinder. From this position he gets a safe unobstructed view of the grinding wheel at point of contact and can observe the work at all times.



Heavy work of practically any length can be rapidly ground to close tolerances with no more power required than for lighter work — the UK's table is always stationary. Picture shows end of 35′ base being ground.

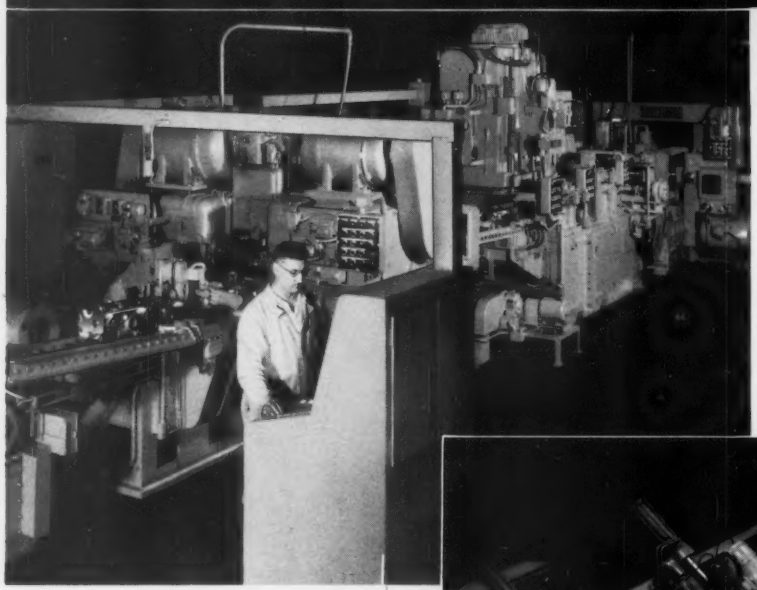
MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

when you need PRODUCTION

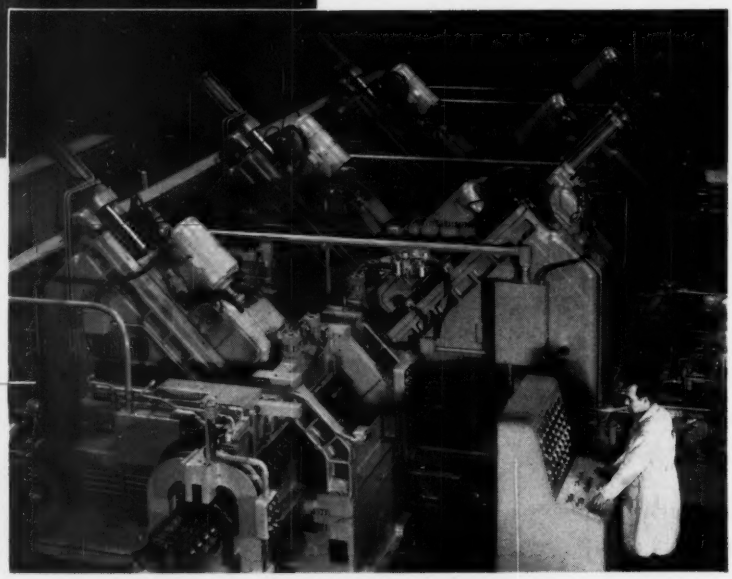
USE SUNDSTRAND "ENGINEERED PRODUCTION" SERVICE WITH TRANSFER TYPE MACHINES...



Four station line for machining 4 cylinder engine blocks. Nine operations are performed including milling, broaching, drilling and reaming.

FOR EXAMPLE:

These highly productive transfer type machines are the result of Sundstrand "Engineered Production" Service. In each case, the manufacturer and Sundstrand Engineers worked close together in finding the best processing method for the job at hand.



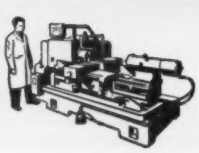
Rough boring unit of line for 8 cylinder V-type engine blocks has 16 spindles.

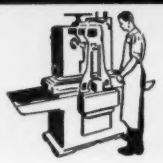
SUNDSTRAND

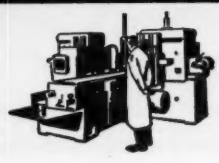
50 YEARS OF *"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

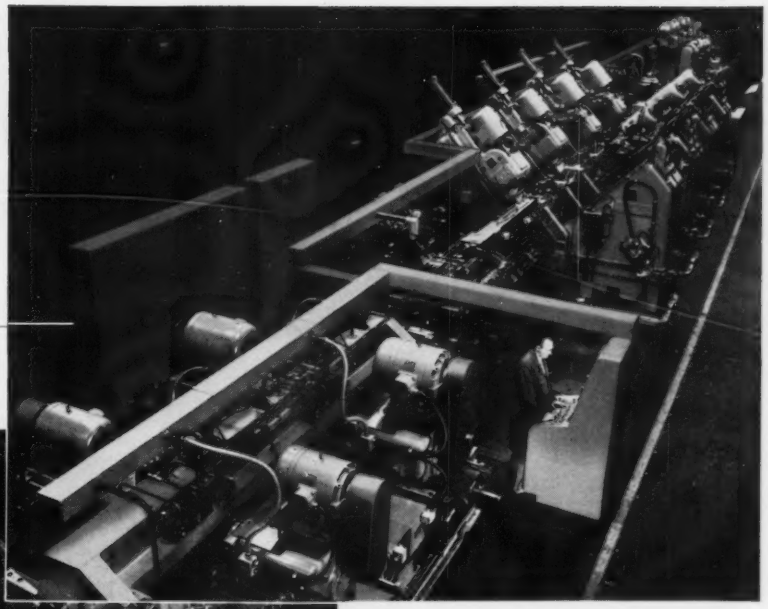


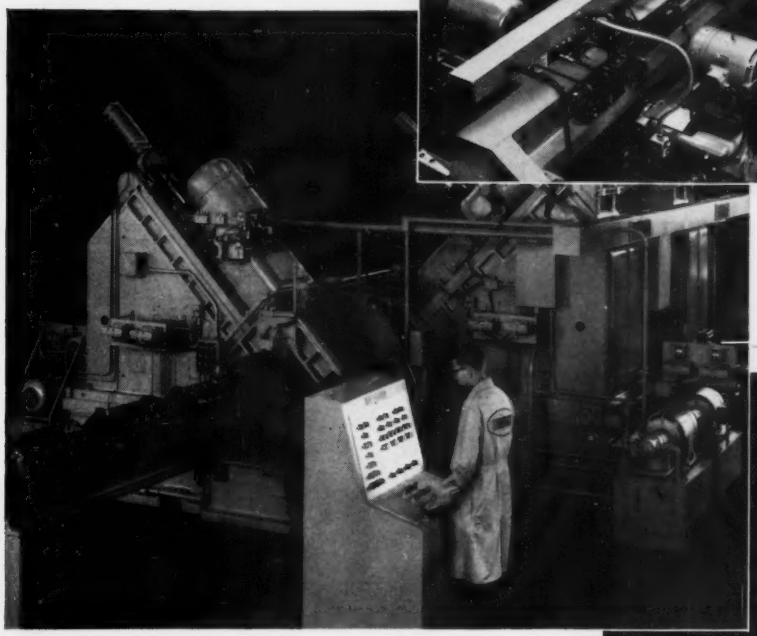




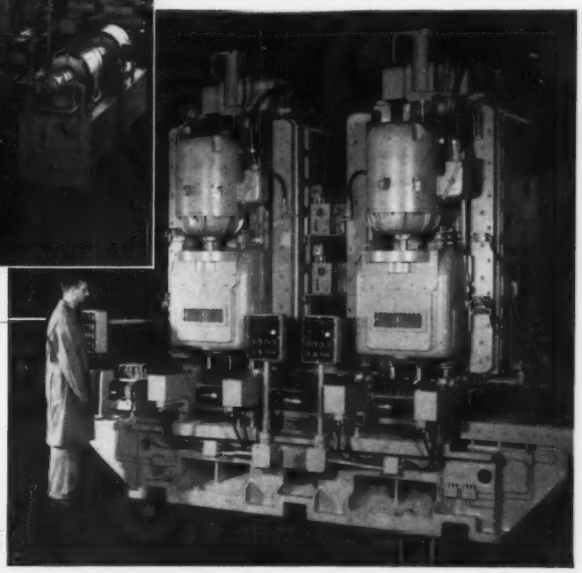
MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

Three unit section of production line has twenty-nine stations for milling, drilling, reaming and checking operations on V-type engine blocks.





Four station finish boring unit for 8 cylinder V-type engine blocks.

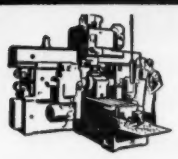


Six spindle two station unit for rough boring six cylinder straight-in-line engine block.

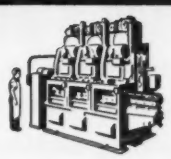
MORE FACTS

about Sundstrand "Engineered Production" are available in this booklet. Write for your copy today. Ask for bulletin 654.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



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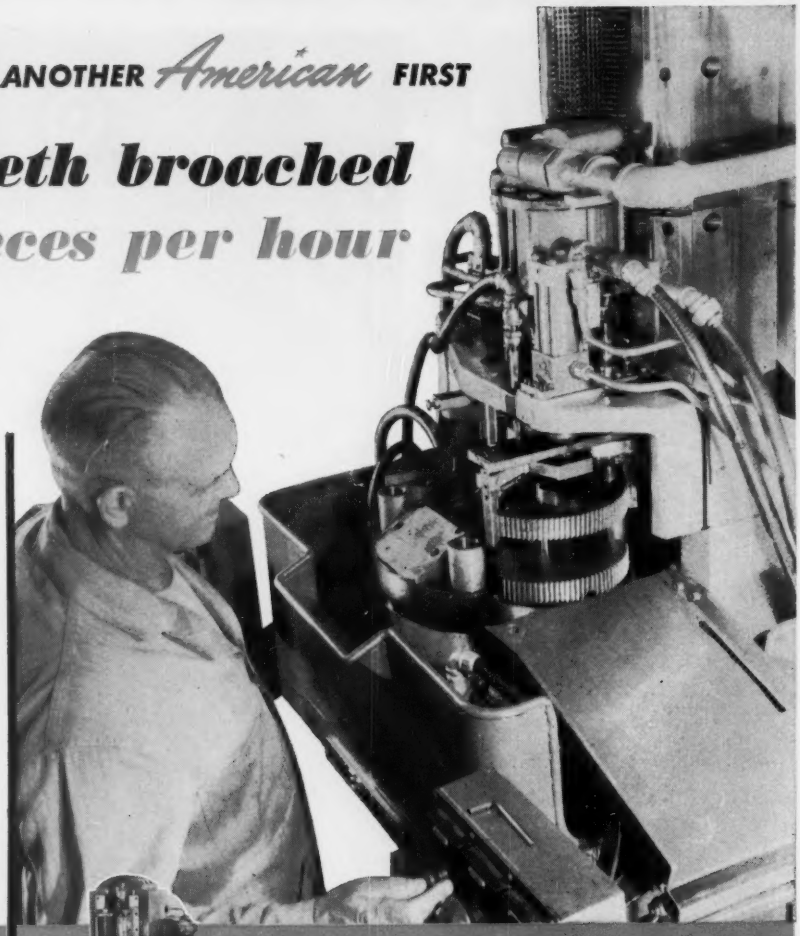
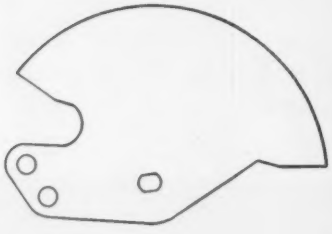
ANOTHER *American* FIRST

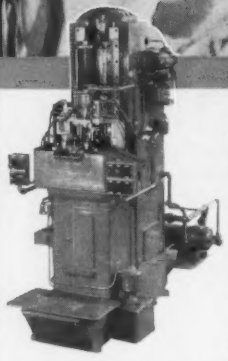
Involute teeth broached in 1200 pieces per hour

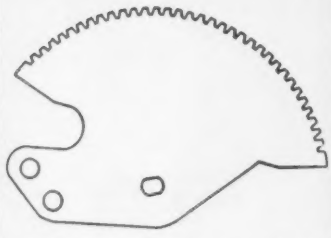
. . . 10 PARTS AT A TIME!



Part before broaching







With involute teeth broached

An indexing fixture, equipped with two loading stations and automatic clamping, is mounted on an American 3-way machine to perform this specialized high production broaching operation. While one station is broaching, the operator stacks 10 parts at the other station. The stack is automatically indexed into broaching position and then clamped. At end of the broaching stroke, the stack is indexed and discharged into a chute by an automatic air ejection unit.

The low piece cost obtained on this machine, is an example of the economies that American gives you — by supplying a machine completely tooled with work-holding fixtures and broaches.

Why not put American to work on *your* broaching problem. A parts print or sample will receive prompt attention. Or write for catalog 450. It is an informative manual on all phases of broaching.

AMERICAN

American BROACH & MACHINE CO.

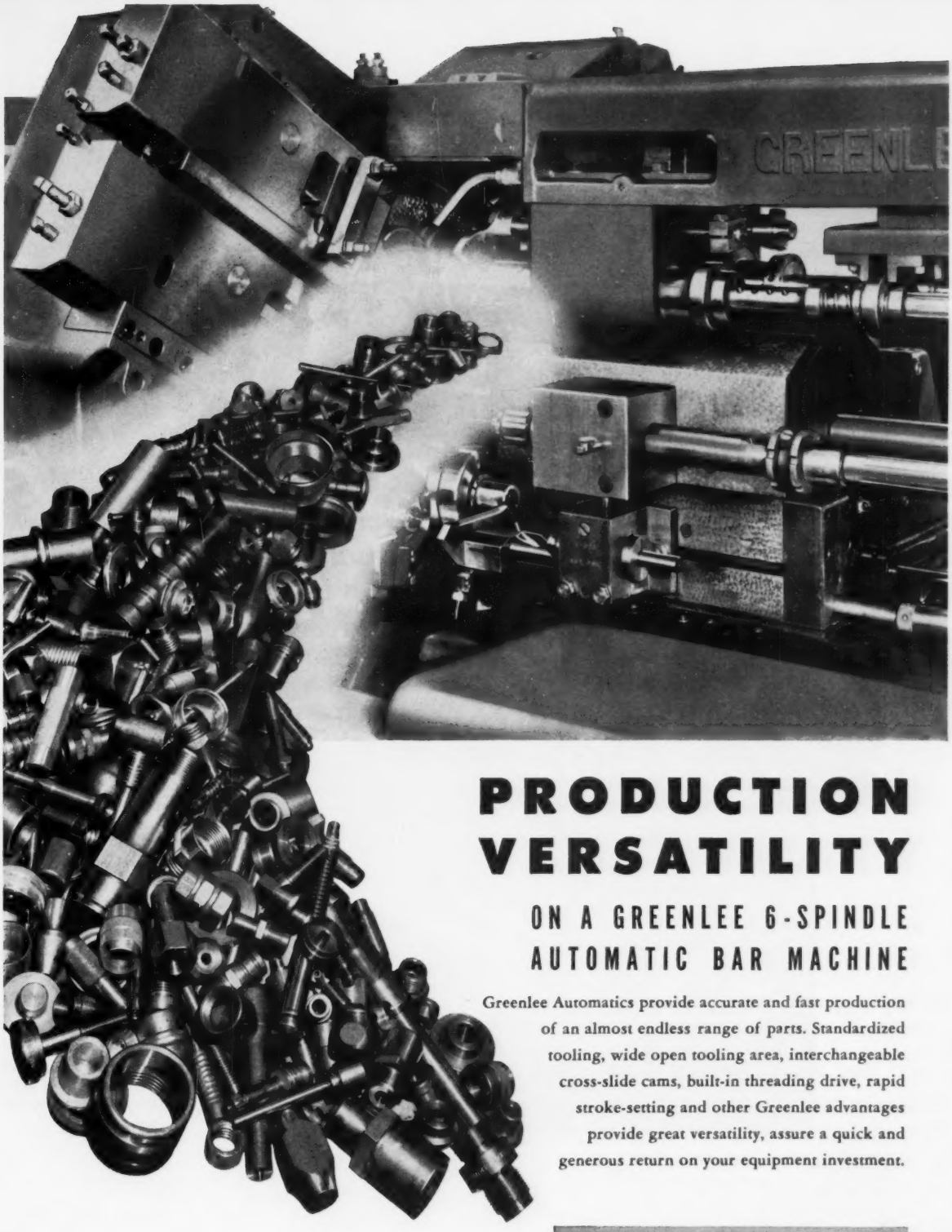
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

SUNDSTRAND

American Building - Ann Arbor, Michigan

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



PRODUCTION VERSATILITY

ON A GREENLEE 6-SPINDLE AUTOMATIC BAR MACHINE

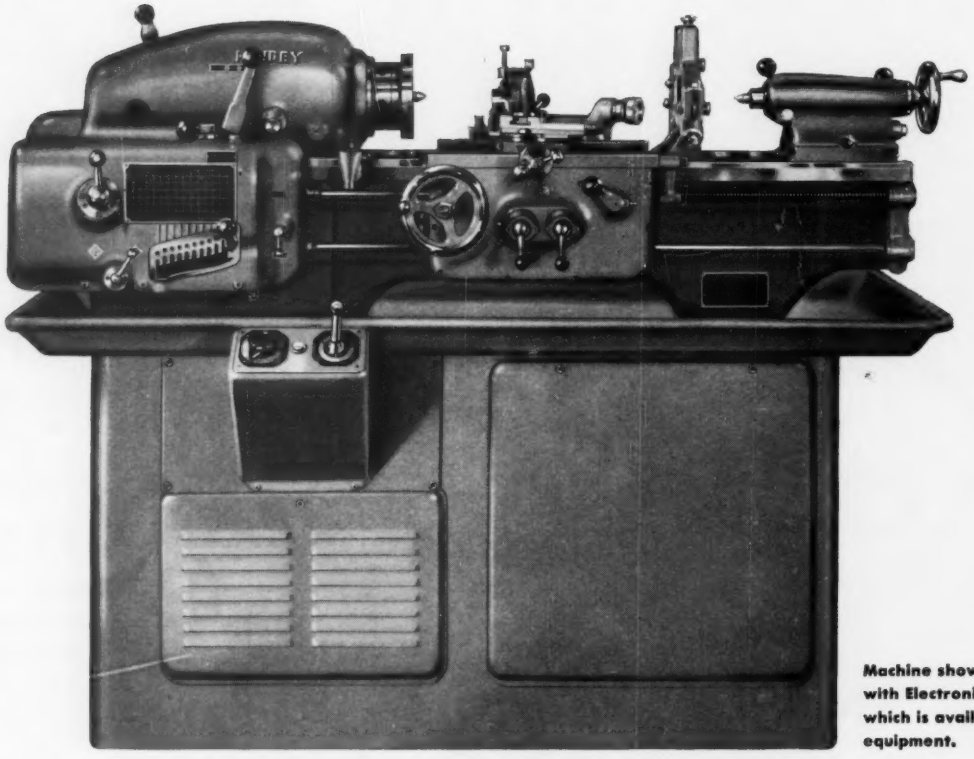
Greenlee Automatics provide accurate and fast production of an almost endless range of parts. Standardized tooling, wide open tooling area, interchangeable cross-slide cams, built-in threading drive, rapid stroke-setting and other Greenlee advantages provide great versatility, assure a quick and generous return on your equipment investment.

PHONE ROCKFORD, ILLINOIS 3-4881
TO HELP SOLVE YOUR PRODUCTION PROBLEMS

GREENLEE
BROS. & CO.
1864 MASON AVE.
ROCKFORD,
ILLINOIS

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

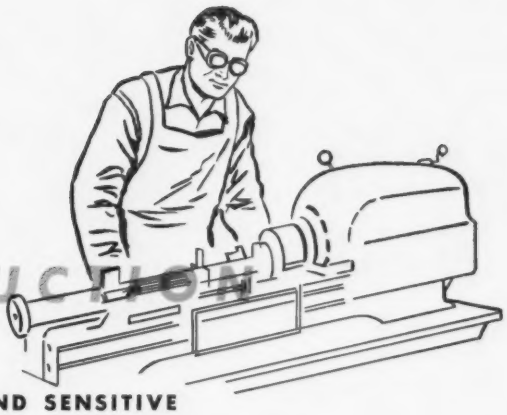
Hendey TOOL and GAGE MAKERS LATHE for PRECISION HIGH



Machine shown is equipped with Electronic Speed Control which is available as extra equipment.

TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



SPEED PRODUCTION

HEAVY DESIGN,
HIGHLY ADAPTABLE AND SENSITIVE
FOR PRECISION WORK AT HIGH SPEEDS.

The Hendey 9" x 24" Tool and Gage-Makers Lathe provides maximum precision and versatility for tool-room and production use. Some of the features of the standard machine include:

Infinitely variable spindle speeds to 3000 RPM
Convenient operation
Hardened and ground V ways
66 quick-change thread cutting and feed changes
Pre-loaded, super-precision, anti-friction spindle bearings
Precision lead screw
Feed shaft independent of lead screw
10¼" swing over ways — 24" Center distance

As extra equipment, this lathe can be furnished with an electronic speed selector for maximum sensitivity of spindle speeds and for full torque at low speeds. Speeds are infinitely variable and can be changed smoothly and easily while under load.

Whatever your toolroom and production problems may be, investigate the 9" x 24" Tool and Gage-Makers Lathe. Call your nearest Hendey representative, or write for bulletin.

See It In Action! Booth No. 221.

MACHINE TOOLS *Hendey* **machine division**
BARBER-COLMAN COMPANY
211 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

INGERSOLL

BLADES: $117.30
CHIPS: 27 TONS

Equipped with 34 carbide-tipped blades costing only $117.30, this 24″ diameter Ingersoll Shear Clear Face Mill removes 27 tons of hard die block steel before the blades are used up in resharpening.

Blades for Ingersoll cutters are of the highest quality, yet they are the most economical for you to buy because they are manufactured with good production equipment.

The *low cost of replacement blades* is another reason why you should use

INGERSOLL INSERTED BLADE MILLING AND BORING TOOLS

THE INGERSOLL MILLING MACHINE CO.

ROCKFORD, ILLINOIS

WRITE FOR NEW INGERSOLL CUTTER CATALOG No. 60B

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

The ACKNOWLEDGED AUTHORITY of the METALWORKING INDUSTRIES

For forty years . . . through fourteen editions . . . with over a million copies sold, MACHINERY'S HANDBOOK has been the indispensable reference book for designers and builders of mechanical products. Now the 15th Edition, with over 400 pages revised and brought up to date, gives you the latest and most authoritative information on present-day designing, manufacturing and metalworking practices.

Practical Information for Every Shop Man

A modern handbook is a necessity for every man who holds or hopes to hold a responsible job in the mechanical industries. Shop men, as well as engineers and designers, find MACHINERY'S HANDBOOK invaluable. It contains the kind of information that is needed wherever machines, tools, and mechanical devices are designed or constructed.

MACHINERY'S HANDBOOK contains 1911 pages of mathematical and mechanical tables, rules, formulas and general data (see complete table of contents on page 3). Its "math" and other tables never subject to change are accurate to the last decimal point, because Handbook users all over the world have been checking them for 40 years.

How Far Back Are You in the Handbook Parade?

Does your present Handbook give you *today's* answers? The 12th Edition of MACHINERY'S HANDBOOK was published in 1943—only 12 years ago—but . . . 474 pages were revised and 96 pages were added to provide new material for the 13th Edition in 1946. Then . . . 290 pages were revised to provide new material for the 14th Edition in 1949. And now . . . 432 pages have been revised to make the New 15th Edition better than ever and ready to help you tackle the problems of today.

MACHINERY'S HANDBOOK meets this need whether you are a designer, a machinist, a mechanical engineer, a student, a production executive, an apprentice, or an inspector.

Write for your copy of MACHINERY'S HANDBOOK today. If you send payment with your order, we pay postage and handling charges. Your money will be refunded if you decide not to keep the Handbook. Or, if you wish, we will send it to you under our Five-Day Free Examination Plan; you pay only after you have seen and used the Handbook, and discovered how much it can help you in your work.

ORDER YOUR COPY TODAY! $9.00

In Canada or overseas, $10.00

THE INDUSTRIAL PRESS
93 Worth Street, New York 13, N. Y.

Want to make more money in '55

on your second operation work?

here's a tip

GET RID OF YOUR OBSOLETE HAND SCREW MACHINES

Why continue to waste money (and, what's worse, lose business to competitors) because of high shop costs due to inefficient production machines?

this NEW Wade® no. 73 HAND SCREW MACHINE

has features that give you high production... to extremely close tolerances. Some of these features are patented — exclusive with Wade.

Send for descriptive circular on the **WADE NO. 73 HAND SCREW MACHINE**

Address:
52 River Street

THE WADE TOOL CO.
WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

For more information on products advertised, use Inquiry Card, page 257

Here's the best shortcut in the field of organic finishing

One operation usually removes paint, rust and oil at the same time.

One tank of Oakite Rustripper frequently does all these jobs: (1) strip rejects and conveyor hooks; (2) pickle rusted stock; (3) prepare reconditioned products for refinishing operations.

One tank may eliminate many tanks used in ordinary cycles.

STRIP → RINSE → PICKLE → RINSE → NEUTRALIZE → RINSE

OAKITE RUSTRIPPER

RINSE → PREPAINT → DRY → PAINT

FREE Our illustrated booklet tells how this amazing cleaner - stripper - deruster offers tremendous possibilities for saving minutes, hours, dimes, dollars. Write or send coupon for your copy.

Here's the best shortcut in the field of electroplating

One operation usually removes rust and oil at the same time. One alkaline tank may remove oxides, drawing compound residues and other stubborn soils . . . even strip zinc and cadmium from rejects and racks.

Sensational Oakite Rustripper frequently eliminates acid pickling and its troublesome after-effects: (1) hydrogen embrittlement; and (2) smut that must be removed by electrocleaning or hand brushing.

ALKALINE CLEAN → RINSE → PICKLE → RINSE → ELECTROCLEAN → RINSE

OAKITE RUSTRIPPER

RINSE → ELECTROPLATE → RINSE → CYANIDE or ACID DIP

FREE Our illustrated booklet tells how this shortcut may save you time and money—in tank lines, in automatic platers, in barrel lines—by saving equipment, floor space, acids, water, steam and electricity. Write or send coupon for your copy.

Technical Service Representatives in Principal Cities of U. S. and Canada

SPECIALIZED INDUSTRIAL CLEANING
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MATERIALS · METHODS · SERVICE
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Send me a free copy of the booklet checked:

☐ *"Here's the best shortcut in the field of organic finishing"*
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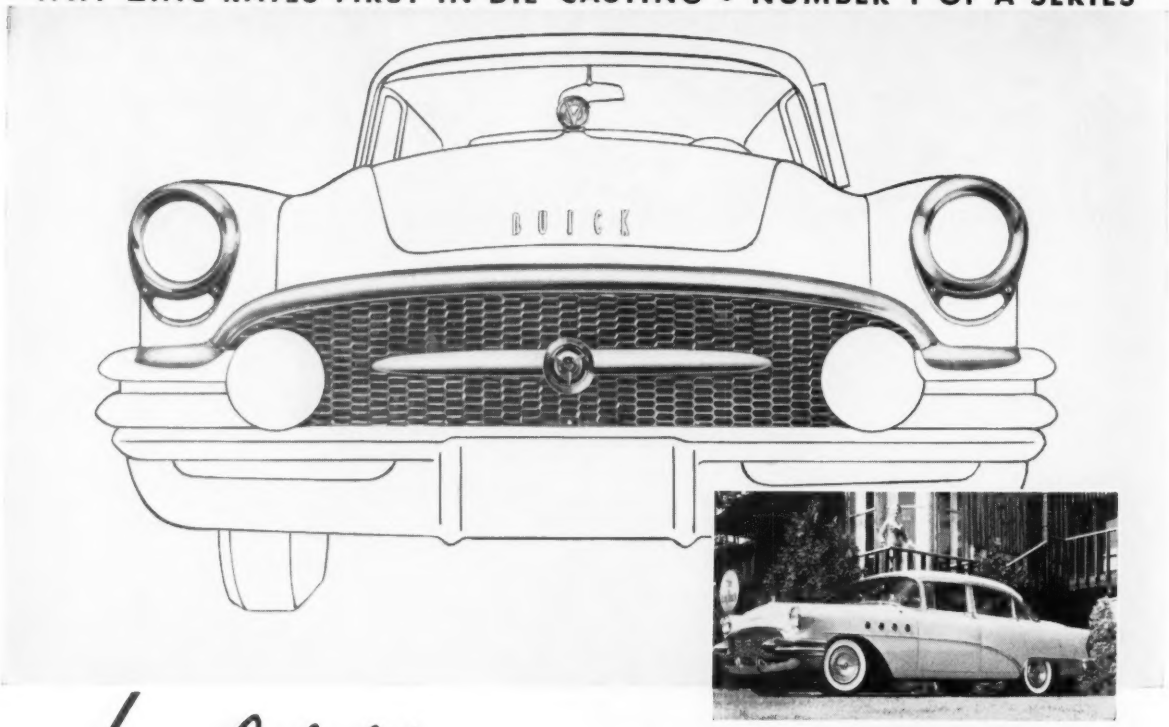
NAME_____

COMPANY_____

ADDRESS_____

WHY ZINC RATES FIRST IN DIE CASTING • NUMBER 1 OF A SERIES



finishability as typified by BUICK

The distinctive beauty of the 1955 Buick front end bright-work bears impressive testimony to one of the principal reasons why ZINC is the most widely used die casting metal. Because they are ZINC, these die castings are *economically* finished in a handsome, durable chromium plate. No other die casting metal can match ZINC in providing both castability and plateability at low cost.

You have a complete choice of finishes when you specify ZINC die castings for the assembly of your products. Electroplating of ZINC die castings, especially with copper-nickel-chromium, is done on a very large scale. Or you may choose from a variety of organic coatings, such as enamels or lacquers, with assurance that a minimum of surface preparation will be required on the smooth as-cast parts. If a decorative treatment is not needed, but unusual exposure conditions prevail, ZINC die castings can be protected inexpensively by the application of Cronak*—a dichromate dip.

Our advertisments in this magazine in the months ahead will explain why and how ZINC die castings cut costs and improve the salability of a variety of products. Send for a copy of the new brochure shown here and contact any commercial die casting company regarding your particular production problems.

*For full details of the Cronak process write to The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

Send for your copy

The New Jersey Zinc Company
160 Front St., New York 38, N. Y.

ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

For more information on products advertised, use Inquiry Card, page 257

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

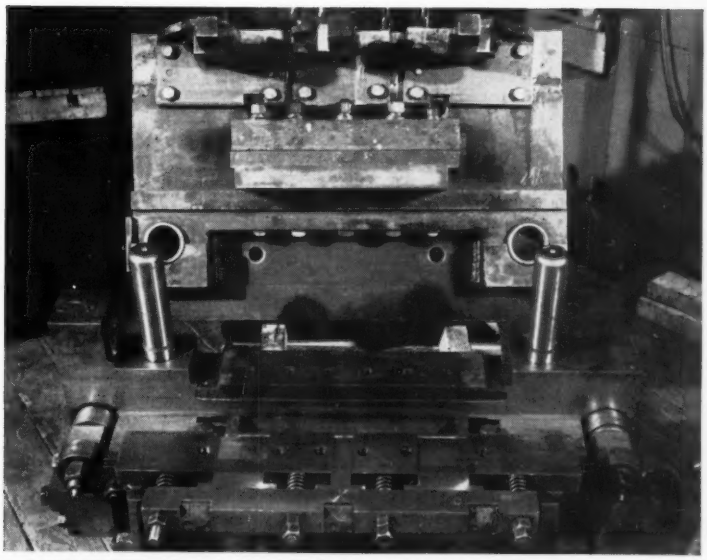
Export Distributor: Bethlehem Steel Export Corporation

600 Stovepipe Shields Turned Out per Hour with BTR Hollow-Bar Die

In a blanking and forming operation, the Par Machine & Engineering Co., Brooklyn, uses this 58-ton press to make stovepipe shields from chrome-plated 0.015-in. steel. The die, made from five separate pieces of BTR (Bethlehem Tool Room) Hollow-Bar, is hardened to Rockwell C 60-61. It is interchangeable so that four inside diameters can be blanked and formed, and turns out as many as 600 pieces per hour.

BTR Hollow-Bar is made from our oil-hardening tool steel by a process called high-speed trepanning. With this method, hammer-forged round bars are cored out in the center, and are then rough-turned on the outside.

BTR Hollow-Bar makes it unnecessary for you to lose valuable time waiting for forged rings or discs. And there's no drilling, rough-boring, rough-facing or rough-turning required! For full information about BTR Hollow-Bar, just get in touch with your tool-steel distributor.



67 CHISEL DIE MAKES 14,000 CUTS BETWEEN GRINDS

Here's a die that's giving a good account of itself producing ends for expanded steel joists. Made of Bethlehem 67 Chisel, it blanks approximately 14,000 I-beam sections, varying in thickness from 3/16 in. to 3/8 in., before redressing is required. 67 Chisel, our chrome-tungsten shock-resisting steel, has good wear-resistance. Moreover, it is an easy steel to machine and heat-treat.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

How to "Blue" Hot-Work Tools

Regardless of the lubricant used in hot-work tools, operators of such tools are continually searching for improvement. For "pickup" of metal on the tools, though a serious problem, can be minimized by good lubrication.

"Bluing" hot-work tool surfaces is a procedure which will aid the normal lubricating procedure on virtually every type of hot-work tool. As most tools of this type are ordinarily double-tempered, "bluing" can be accomplished with no expense or delay by following this heat-treatment procedure:

1. Quench tools in customary manner.
2. Temper tools as usual, to desired hardness.
3. Grind to finished dimensions.
4. Retemper at 1000 F, or higher. Temperature should be 50 F lower than the first temper. Thus the second temper serves as the "bluing" operation.
5. Tool can be placed in service without further operations on its dark, discolored surface.

Here's something else to keep in mind: when hot-work tools are redressed, it is also wise to retemper them not only for stress-relief, but also to obtain the "bluing."

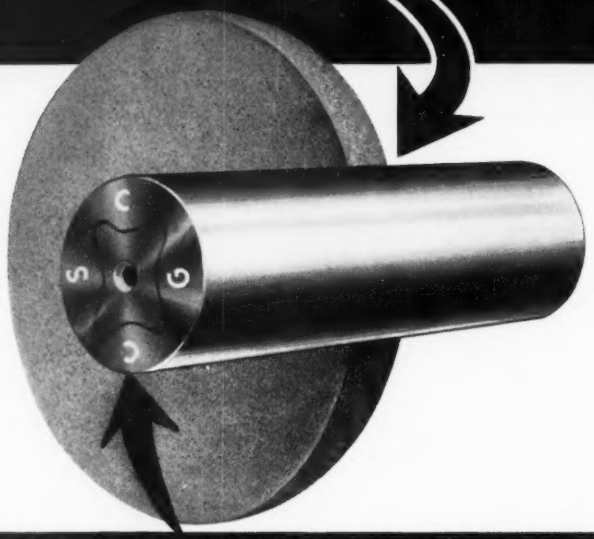
An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,

smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

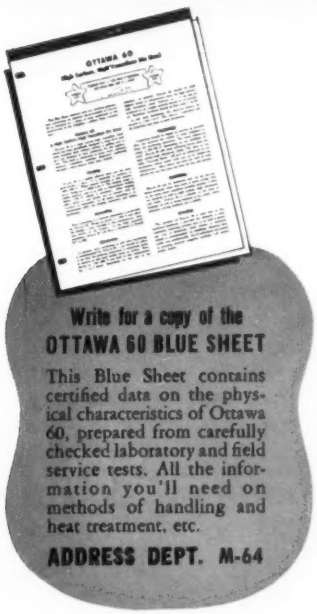
Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845 **INCORPORATED 1892**

For more information on products advertised, use Inquiry Card, page 257



Write for a copy of the OTTAWA 60 BLUE SHEET

This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.

ADDRESS DEPT. M-64

OTTAWA 60 is a *new* die steel, an A-L "original," developed primarily to deep draw and form stainless steel. As intended, it performs without galling or pickup and shows exceptional wear resistance in that service. We have plenty of case histories to show you in proof.

But *wherever* you use Ottawa 60 draw dies—not just on stainless steel—this high-carbon, high-vanadium alloy comes through for you. Illustrated above are the first and second draws on transformer housings, produced from .037″ gauge SAE 1010 strip. The company formerly used dies made of 5% chrome air-hardening die steel—and later a more highly alloyed material—without ever getting more than about 2000 pieces before the dies began to show gall marks and pickup, and parts were rejected due to scoring, breakage and oversize. *Dies made from Ottawa 60 forgings cured that! Results after 25,000 pieces showed no pickup and no wear on punch or die.*

● You can solve many a problem and save real money with Ottawa 60 draw dies! Write for information or call in our Field Service Staff to help you get started. ***Allegheny Ludlum Steel Corporation, Oliver Bulding, Pittsburgh 22, Pa.***

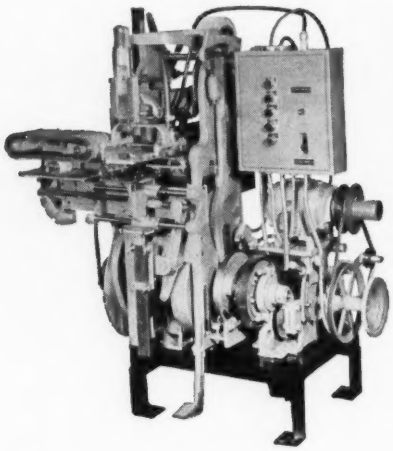
For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 5463

AL® FINE TOOL STEELS SINCE 1854

Fit as a fiddle . . . aptly describes this Ductile Iron camshaft drive gear. It was installed in an automatic labeling machine on March 3, 1952, at Bestway Products, Inc., Rahway, N.J. Ductile Iron "as cast" provides high strength, resistance to wear and galling, with good notched endurance properties. Inspection of the gear on June 15, 1953, found it to be as good as new and it's still on the job.



12 TIMES Longer Service with Ductile Cast Iron Gears

Harmony in motion . . . is essential in the musical record business, where downtime of equipment stops deliveries with dire results. Look at this "Pony Label-Dri" automatic labeling machine, produced by New Jersey Machine Corporation, Hoboken, N. J. One of this type labels records for Bestway Products, often 'round the clock.

"You can't sell Christmas records in January."

That's the way Louis Quitoni, Plant Superintendent, of Bestway Products, Inc., put the problem when his labeling machine – geared for 1,000,000 records a month – kept breaking down.

Imagine the backlog that built up, and what happened to deliveries . . .

Until this Ductile Cast Iron gear was installed.

"The latest gear . . . machined from a Ductile Iron casting," writes Bestway Products, "has given a truly remarkable performance."

The two principal requirements of this gear are 1) a high order of wear resistance and 2) ability to withstand sudden shock loads imposed by a knife clutch. This machine is intermittently operated and tripped 3 or 4 times a minute.

So far, Ductile Iron has given 12 times the service of high test iron gears which failed in about 2 *months*. So far, the initial Ductile Iron replacement has served 2 *years*, and it's still on the job.

New Jersey Machine Corporation, builder of this machine, as a result of this service life has standardized on Ductile Iron for camshaft drive gears for original and replacement installation.

In plants from coast to coast, Ductile Iron is saving money at every turn. How? By its remarkable load-carrying ability and wear resistance, combined with excellent castability, ready machinability and moderate cost.

Send us details of prospective uses. We'll gladly suggest a source of supply from some 100 authorized foundries now producing Ductile Iron under patent licenses. Request a list of available publications on Ductile Iron . . . mail the coupon now.

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

Please send me a list of publications on DUCTILE CAST IRON.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

SYMBOL OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

For more information on products advertised, use Inquiry Card, page 257

Universal collapsing tap parts of **MAX-EL** alloy steel finish machined after full heat treatment

Considerable machining is required in the manufacture of parts for these taps. That's why Crucible MAX-EL® 3½ free machining alloy steel was chosen by the Geometric Tool Company, Division of Greenfield Tap and Die Corporation. For with MAX-EL you can rough machine, *then* heat treat even intricate parts before final machining *with no danger of distortion of the steel.*

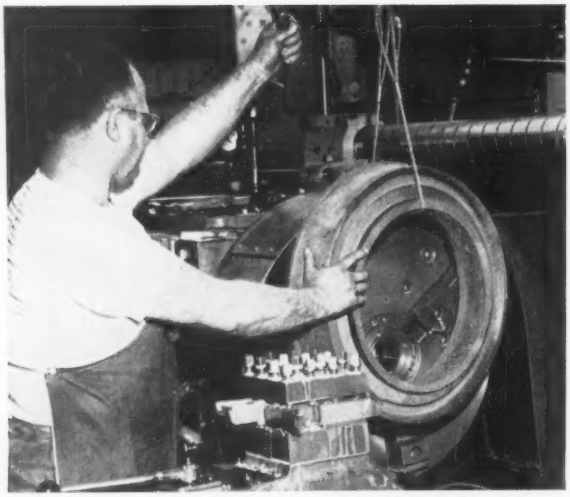
But the best way to check the advantages of MAX-EL is to try it in your own shop. Like many other users you'll appreciate its superior machinability, freedom from distortion, deep hardenability characteristics, uniformity and quality. And you'll like the longer tool life you get by using MAX-EL.

For complete data . . . and *quick delivery* of MAX-EL alloy steels *call Crucible.*

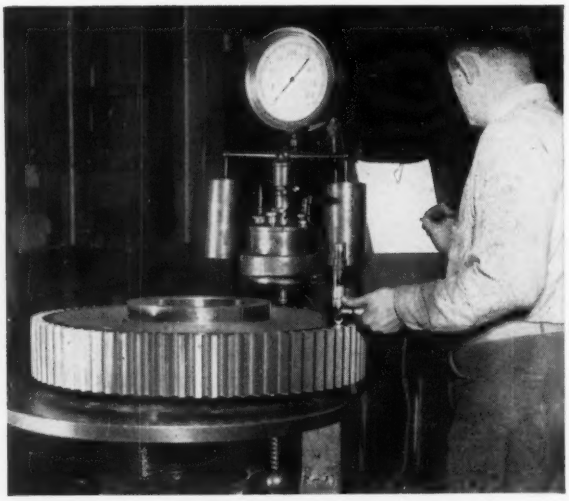
CRUCIBLE first name in special purpose steels

54 *years of* Fine *steelmaking* **ALLOY STEELS**

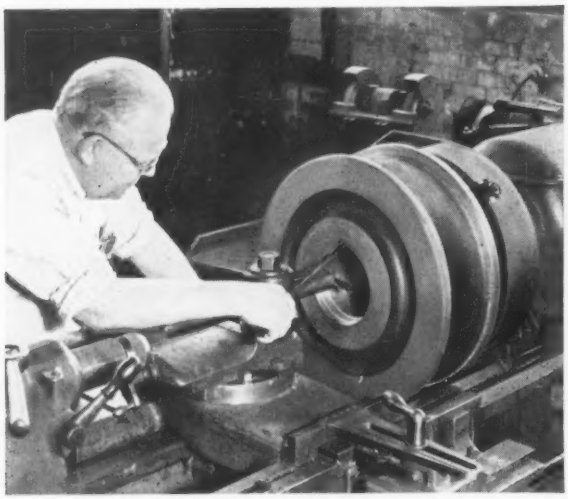
CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.



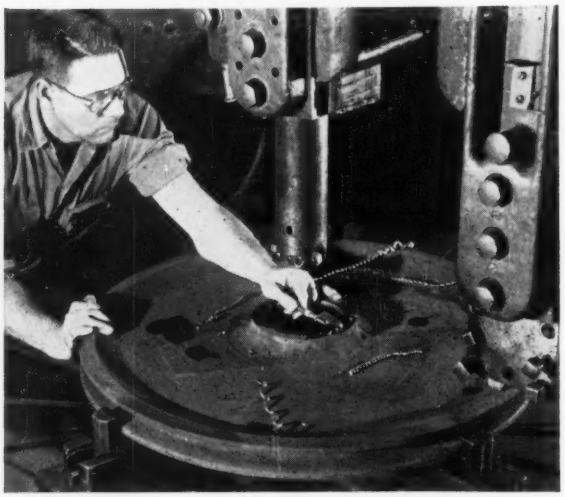
COMMUTATOR FORGING being positioned for machining.



SPUR GEAR for use in diesel locomotive service.



CRANE-TRACK WHEEL for heavy-duty overhead crane.



SHEAVE WHEEL—one of 43 in large floating crane.

So Many Different Uses for These Forged-and-Rolled Blanks

If you require circular steel blanks in the making of your products, Bethlehem has much to offer you, both in quality and variety. We manufacture forged-and-rolled blanks for a seemingly endless number of uses, and each year the list grows bigger.

Here are a few of the products being made today from these circular forgings: spur, bevel, and herringbone gears; double-flange crane-track wheels; industrial wheels of many kinds; turbine rotors and bucket wheels; clutch drums, brake drums; sheave wheels, flywheels; tire molds and mold rings. There are many additional applications, of course, some of them highly specialized.

Often the first problem in designing such products is to achieve high strength with a minimum of weight. Bethlehem's manufacturing process supplies an answer to this common problem. The blanks are processed in a unique mill that combines the steps of forging and rolling, so that the blanks have the density of forged metal plus the smooth grain flow of a rolled product. The end result is strength—strength so high that users often find it possible to employ thinner, lighter sections than they formerly specified.

Moreover, because of these same characteristics, the blanks machine more uniformly. Fewer machining cuts are required, and the cutting speed is frequently higher.

Bethlehem forged-and-rolled blanks are available in many different types, and in sizes from 10 to 42 in. OD. They can be furnished untreated or heat-treated, whichever you prefer. Write, phone, or wire our nearest office for complete information.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

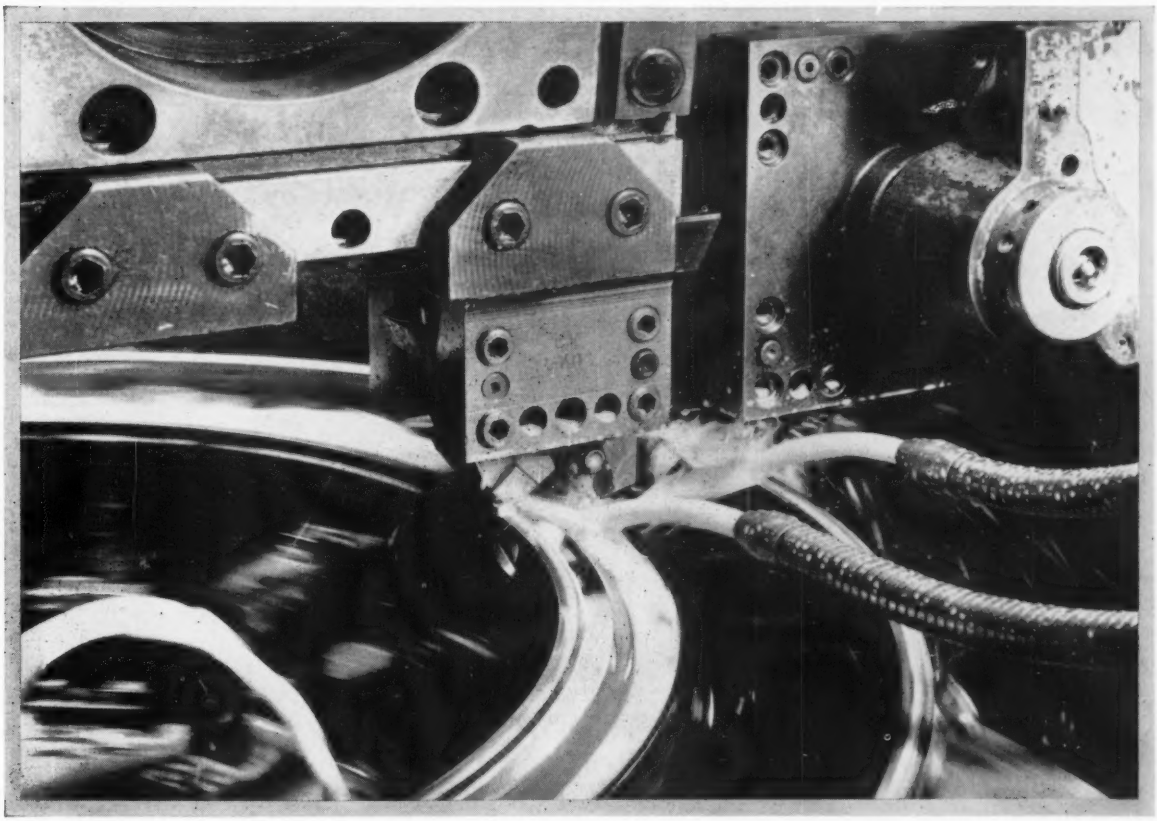
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Industry-wide records
prove that . . . as compared with other
steel-cutting carbides . . .

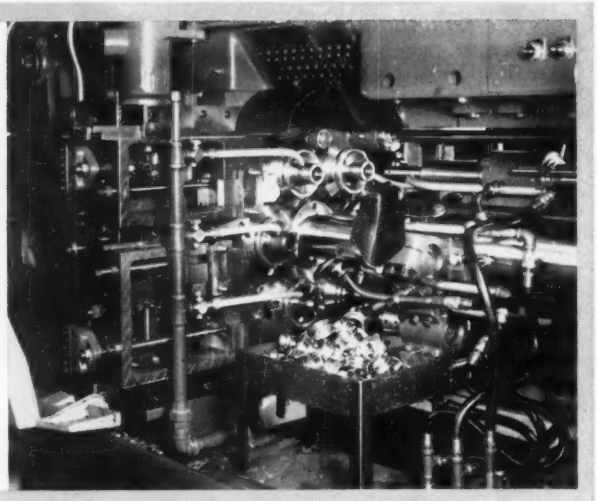
Carboloy® Grades 350, 370 carbides increase production as much as 3⅔ times



BEFORE CARBOLOY GRADE 370, 17 other carbides were tried by the Jet Division, Thompson Products, Inc., for facing 310 stainless-steel jet-engine compressor frames. The best any carbide could do was 3 pieces per 8-hour shift. With Grade 370, production jumped to 14 pieces. Tool life was doubled; tool inventory was lowered. Downtime losses were cut because Grade 370 inserts machined almost 3 times as many pieces per grind.

SETUP: Material—310 Stainless steel. **Speed**—340 SFPM. **Feed**—0.008 inch. **Depth of cut**—0.100 inch at 36 rpm. **Coolant**—Yes.

For other reports of new production and efficiency records set with Series 300 carbides, see the following pages.

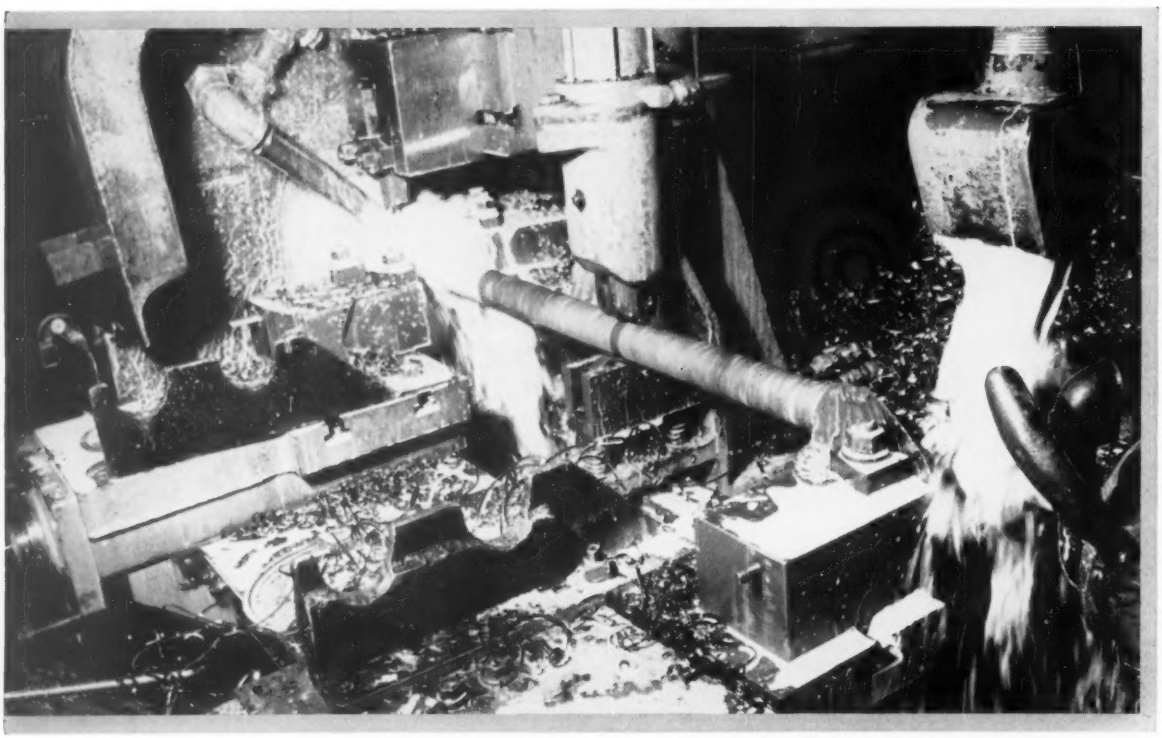


PRODUCTION TIME WAS CUT IN HALF when Grade 370-equipped tools were installed in this Cone 6-spindle bar automatic. Seven Grade 370 tools did the job of fourteen high-speed steel tools for machining inner bearing races.

SETUP: Material—SAE 52100 steel tubing. **Speed**—333 SFPM. **Coolant**—Yes.

Case-history proof of how . . .

New Carboloy Steel-cutting

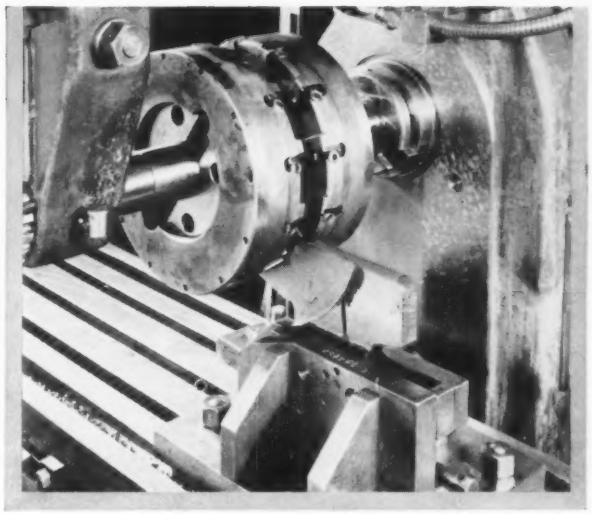


PRODUCTION WAS INCREASED more than 33% when Carboloy Grade 350 tools were used to turn this AISI 4150 48" truck axle forging. Grade 350 machines front and back ends simultaneously; eliminates chipping and flaking encountered with other carbides.

SETUP: Material—AISI 4150 steel forging. **Speeds**—200 SFPM on 2-inch dia.; 400 SFPM on 4-inch dia. **Feeds**—0.014 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.

SWITCHING TO GRADE 370 inserts, for straddle milling this forging, enabled Robert H. Brooks Co. to go from almost no production to completely satisfactory production. Grade 370 held tolerances to the required thousandths on this jet fighter wing fitting; produced so fine a finish that it is impossible to determine the blend line after plating.

SETUP: Material—SAE 4140 forging, heat-treated between 40 to 43 Rockwell C. **Speed**—650 SFPM. **Feed**—0.0025 inch per tooth. **Depths**—0.062 inch and 0.083 inch. **Coolant**—Yes.



Grades outcut, outlast all other carbides

Here's why Series 300 carbides will immediately bring you increased production and greater operating efficiency:

1. Grades 350 and 370 have been designed for you to get the most out of your machine tools. They can operate without tip deformation at higher speeds and faster feeds than other carbides. This built-in production ability lets you take full advantage of your equipment.
2. Grades 350 and 370, proved by in-plant records, give more production per grind, more grinds per tool, more production per shift. In short, in hundreds of operations similar to those on these pages, they have outperformed other carbides in every respect.

Carboloy Series 300 carbides are made by a new carefully controlled process. This process gives Series 300 a built-in structural rigidity, which enables them to operate at temperatures as high as 1800° F. . . temperatures that cause cutting-edge deformation in other carbides.

You can get Carboloy cutting tools, boring tools, inserts and blanks of Grades 350 and 370 in a wide range of styles and sizes. Your Authorized Carboloy Distributor can fill your orders immediately. For the new Series 300 price list GT-305, send coupon on the next page, today.

Carboloy Created-Metals for Industrial Progress

Your Authorized Carboloy Distributor
can meet your steel-cutting needs from his . . .

New, enlarged line of Series 300 tools and blanks

With the addition of 117 new sizes of standard tools and blanks, your local Authorized Carboloy Distributor can now give you immediate delivery on practically every Grade 350 and 370 tool and blank you need. Many other sizes and styles are available nonstock from the Carboloy plant in Detroit.

Carbides for cutting all materials

In addition to the Series 300 carbides, complete stocks of Carboloy tools and blanks are available in various grades, for machining all materials—ferrous or nonferrous, metallic or nonmetallic.

The following standard-grade items have also been recently added to the standard line:

- 20 sizes of Grades 883 and 44A style 0000 blanks for heavy-duty cast-iron and nonferrous cutting.
- Throwaway-type blanks.
- Grade 883 style F and G offset turning tools in $\frac{1}{2}$ and $\frac{5}{8}$ inch sizes.
- Offset threading tools.

For price lists and specifications on Series 300 carbides and standard grades, send coupon today.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

CARBOLOY
Department of General Electric Company
11147 E. 8 Mile St., Detroit 32, Michigan

☐ Send Brief-a-Log GT-305, containing price list and specifications on Grades 350 and 370.

☐ Send Brief-a-Log GT-285, containing price list and specifications on standard grades.

Name _____ Title _____
Company _____
Address _____
City _____ Zone ___ State _____

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

See the Yellow Pages

. . . for the name of your local Authorized Carboloy Distributor. You'll find his name under the Carboloy trademark listing in classifications: TOOLS or TOOLMAKERS.

For more information on products advertised, use Inquiry Card, page 257

spot the champ

. . . and with high speed steels the champion's always REX

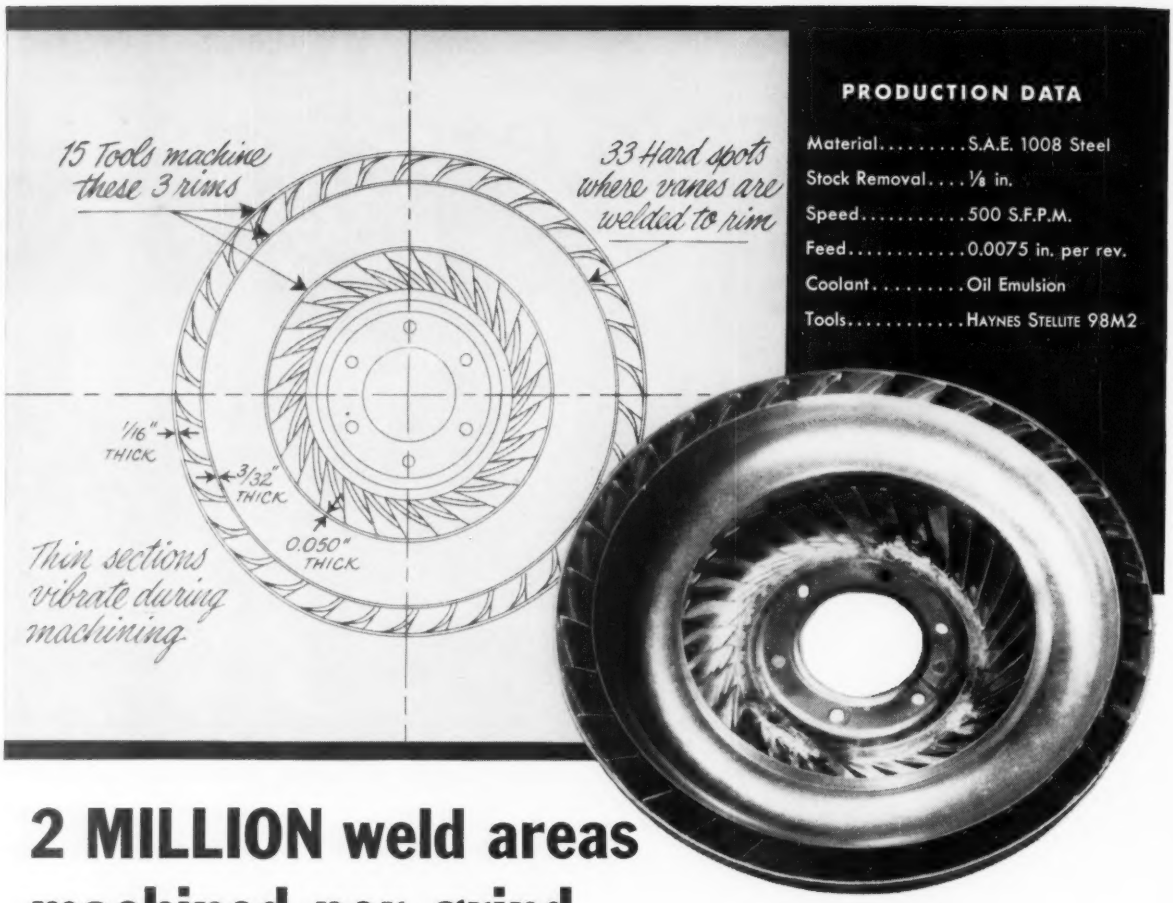
Compare the freckles and you'll pick the champ. And it's easy to spot the champ in high speed steels, too, for Crucible REX® has been the *standard of comparison* for over half a century.

Prove the reasons for REX's superiority in your own shop. You'll like its hardenability . . . response to heat treatment . . . fine tool performance. Like thousands of other users, you'll agree *you can't find a high speed steel to outperform REX.*

Ask for REX, a *prescription-made* Crucible product, at Crucible warehouses or leading distributors from coast to coast. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



2 MILLION weld areas machined per grind

HAYNES STELLITE 98M2 tools machine 1,000 of these torque converter turbine wheels between grinds. Fifteen tools are used to machine the three rims. There are 33 weld areas on one of the rims where the vanes are joined to it. On every revolution a HAYNES STELLITE tool cuts through these hard spots. It makes 2,100 interrupted cuts per wheel . . . over two million per grind. In addition, all 15 tools must withstand the shock set up by vibrations of the thin sections.

The parts are double indexed on an automatic lathe at six stations. Spindle speed is about 160 revolutions per minute. Feed rate is 0.0075 in. per revolution. Machining speed is 500 surface feet per minute. Total machining time per turbine is 28 seconds, and approximately 125 wheels are finished in an hour. The HAYNES STELLITE tools operate for a full eight-hour shift without chipping or spalling.

HAYNES STELLITE tools have an unusual combination of red hardness and toughness. They remove metal fast because they can take deep cuts at heavy feeds. For full details write for the booklet, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes," and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

For more information on products advertised, use Inquiry Card, page 257

Industrial Monkey Gets a "Lift" from SHELBY SEAMLESS TUBING

The versatile Industrial Monkey* is ideal for all types of high work operations including tree-trimming, line work, street light servicing, painting, shipyard work, airplane servicing, and fire fighting.

The basic Industrial Monkey unit consists of a hydraulically-operated telescoping boom with a self-leveling work platform. The boom, mounted on a base, swings in a 270 degree arc and operates from the horizontal to vertical at a working height of 50 feet. All movements are electrically controlled, either from the work platform or from dual controls in the truck upon which the unit is mounted.

The agile swinging boom is comprised of an inner and outer member —both of Shelby Seamless Mechanical Tubing. Shelby Seamless is just the ticket for applications like this, for it offers the high strength, uniformity, dimensional accuracy, and dependability that only *seamless* can give. It is available in a complete range of diameters, wall thicknesses, and steel analyses to meet exacting requirements.

If you feel you'd like further information on applying Shelby Seamless Mechanical Tubing to your product, our engineers are at your disposal. Contact them at any time.

*Manufacturer's name on request.

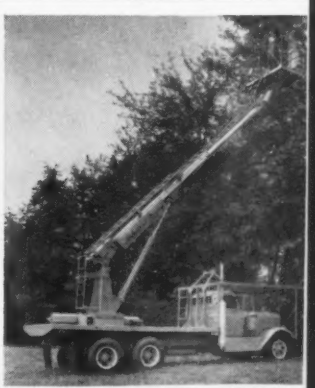
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS Shelby Seamless Mechanical Tubing

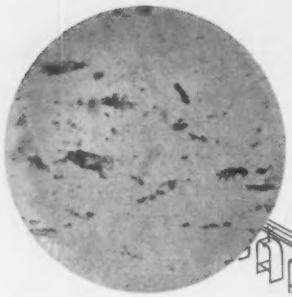
SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

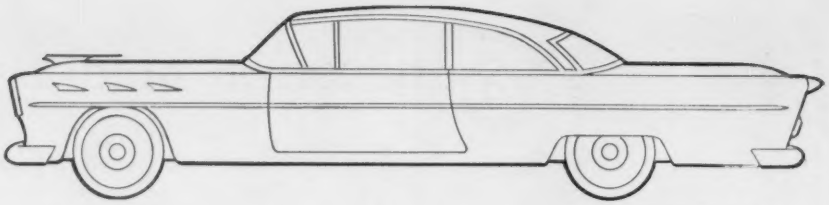
WALLS WITHOUT WELDS

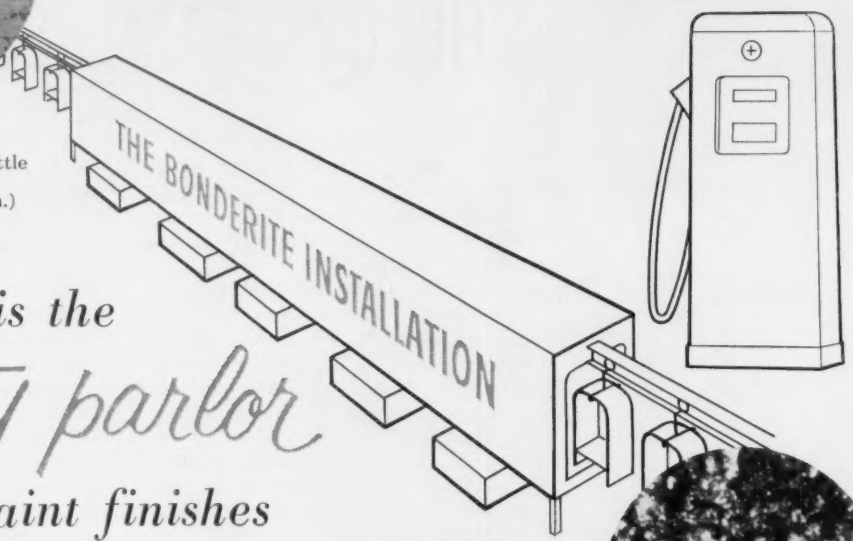


UNITED STATES STEEL

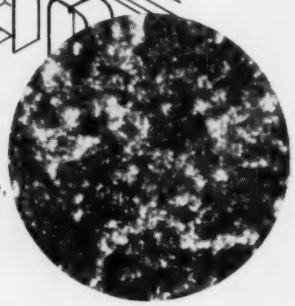


BEFORE BONDERITE . . .
Plain metal surfaces are smooth, slippery, offer little for paint to hang on to. (100 times magnification.)





This is the beauty parlor for fine paint finishes



AFTER BONDERITE . . .
Bonderite-treated metal has a fine, nonmetallic phosphate coated surface, takes and holds paint securely. (100 times magnification.)

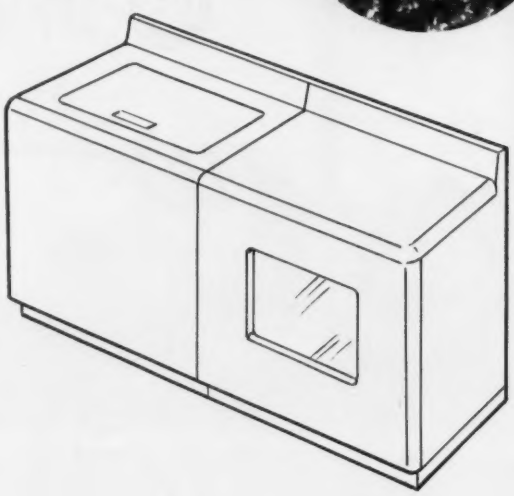
As the photomicrographs show, a trip through the Bonderite "beauty parlor" changes the surface of metal—changes it to a nonmetallic over all phosphate coating which is integral with the metal itself.

This coating protects and preserves beauty three ways: (1) by anchoring the paint, (2) by resisting rust and corrosion, and (3) by preventing the creep of finish failure if the paint film is scratched or broken.

The leading painted metal products in every classification, from automobiles and appliances to steel windows and x-ray equipment, are treated with Bonderite.

Your metal products, too, should all go through the Bonderite "beauty parlor" before they arrive at the paint booth. It's the economical, effective, *proven* way to assure lasting fine appearance for fine paint finishes.

Write for full information.



Since 1915—Leader in the Field

PARKER RUST PROOF COMPANY
2194 E. Milwaukee, Detroit 11, Michigan

PROTECTED BY Bonderite PARKER RUST PROOF CO. QUALITY CORROSION RESISTANT

BONDERITE corrosion resistant paint base

BONDERITE and BONDERLUBE aids in cold forming of metals

PARCO COMPOUND rust resistant

PARCO LUBRITE wear resistant for friction surfaces

TROPICAL heavy duty maintenance paints since 1883

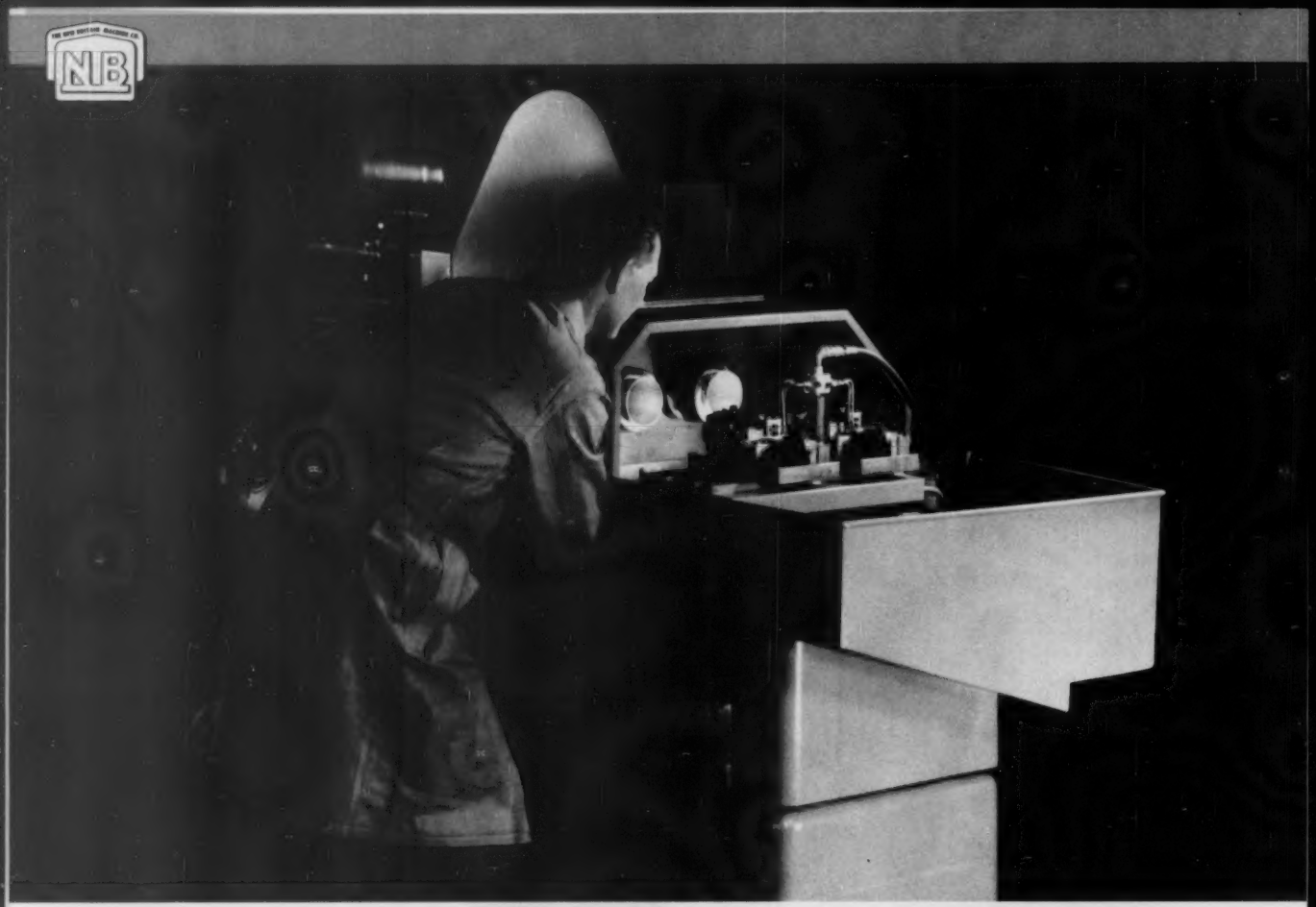
For more information on products advertised, use Inquiry Card, page 257

Sales Up . . . Profits Down?

The Answer is New Methods on NEW BRITAIN

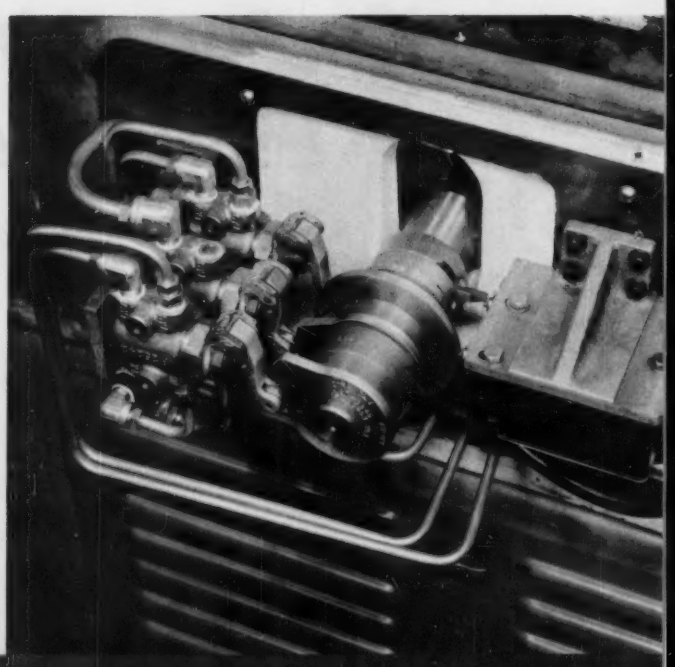
- AUTOMATIC CHUCKERS
- MULTIPLE SPINDLE BAR MACHINES
- SINGLE SPINDLE AUTOMATICS
- PRECISION BORING MACHINES
- LUCAS PRECISION HORIZONTALS
- NEW BRITAIN +GF+ COPY LATHES

See the following four pages for other New Britain *New's*.

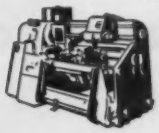


The secret of precision boring is constant close control of the tool

Precision-ground cams assure accuracy of tool paths under all conditions on a New Britain Precision Boring Machine. Equally important is split-second control of cycle timing. This is accomplished by means of the program drum illustrated at the right. Cams and trip dogs accurately time all motions of the tool and the machine units. It is enclosed by a lift-off cover and is immediately accessible from the operator's side of the machine. These are important features of the New Britain approach to more profitable precision boring.



New Britain +GF+ Copying Lathe combines 2 operations in 1 pass

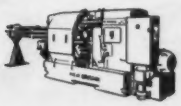


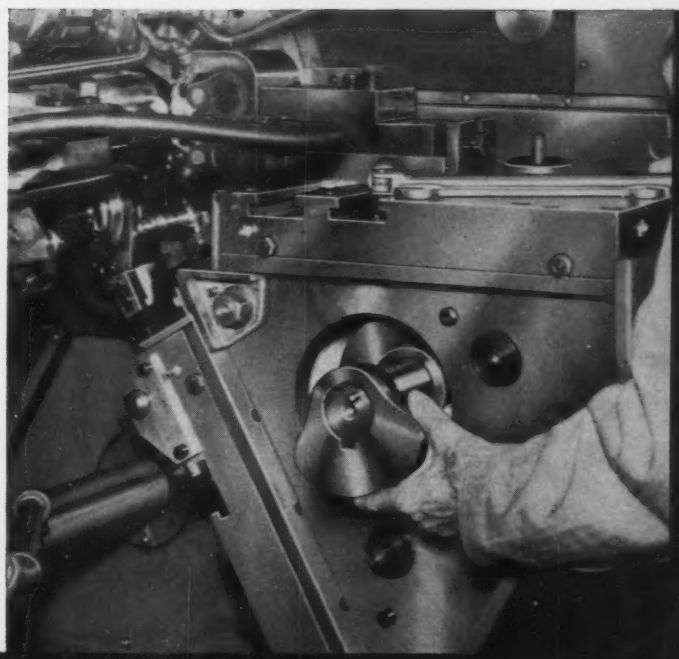
Yes, we taper turn the shaft end of this gear blank and copy turn the rest in the same operation — which keeps the cost of the piece down. This happens all the time on a New Britain **+GF+** copying lathe. You can spot other examples of it in the other pieces on the table.

The New Britain **+GF+** is a copy turning machine, not a lathe with an attachment. The copy slide is part of the carriage for taking heavy cuts at carbide speeds. Contoured work in small lots or on an automated basis, is accurately turned from a simple template on the front of the machine.

The secret of carbides on bar machines is elimination of slide deflection

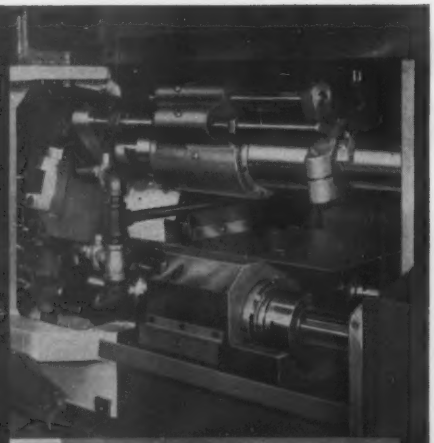
Carbides won't tolerate sloppy feeds. Positive slide actuation on a Model 601 New Britain Automatic results from mounting the cams directly behind the slides. A plus benefit is that cross slide feed changeovers can be made in minutes with these pick-off cams.



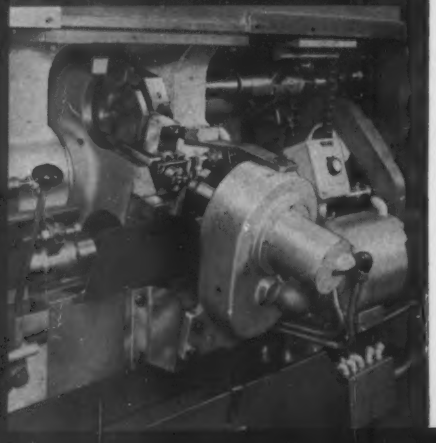


See the preceding two pages and the two following for other New Britain New's.

Six-spindle production in "Three-spindle" time



View of the rear side of the machine with the guards removed, showing the two lower spindles and the upper threading spindle.

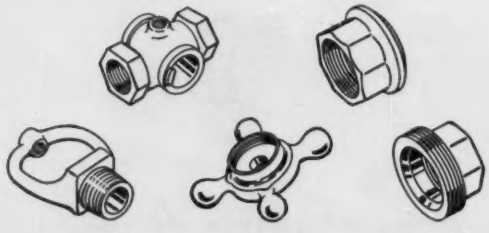


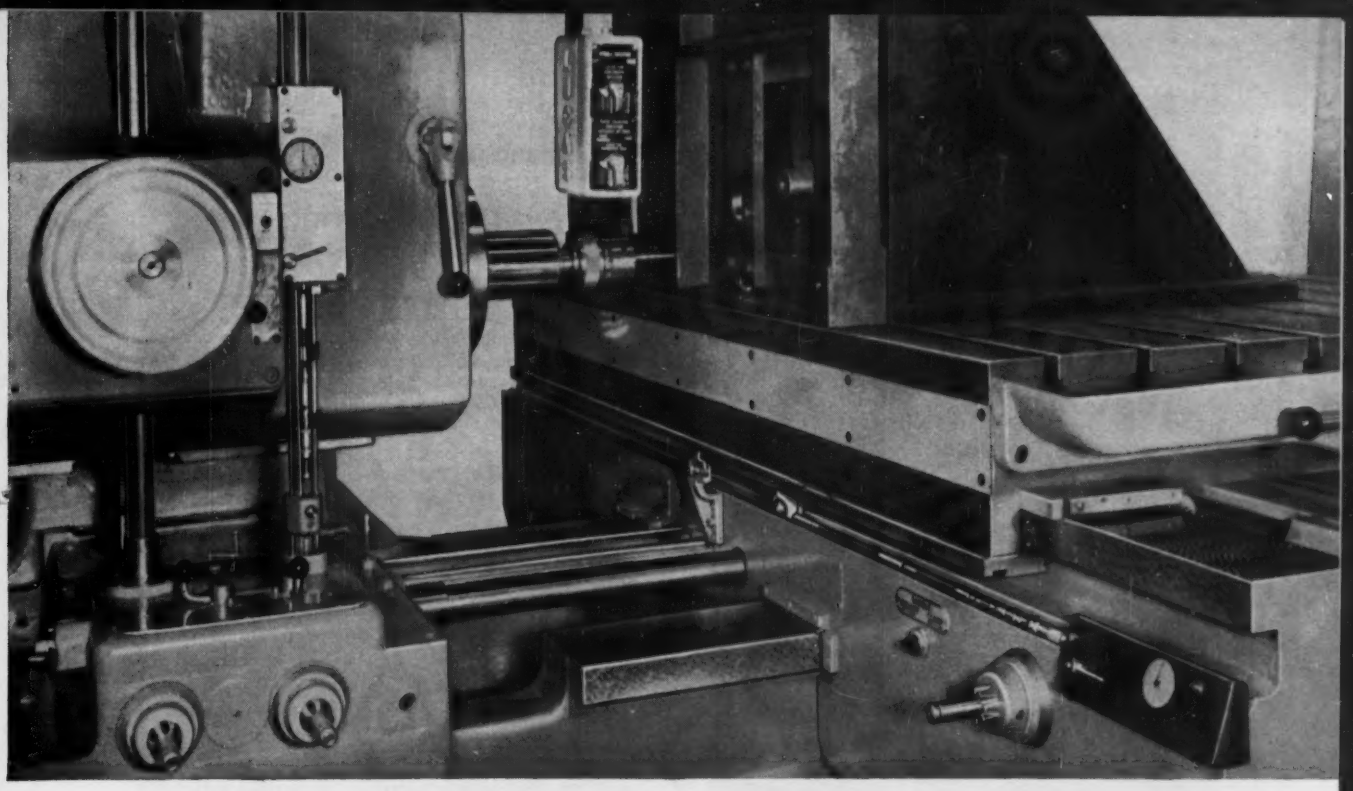
All controls are within easy reach of the operator. Chucking is accomplished during the operational cycle by manual or semi-automatic means.

This new double-end New Britain Model 365 chucker is specifically for parts which can be machined simultaneously at both ends in one chucking, or two pieces per cycle.

It furnishes the *high spindle speeds* required for work on brass and aluminum, plus *beef* for machining and threading steel, plus *accuracy* guaranteed by a new turret locking mechanism. Idle time is minimized by power chucking and rapid traverse of all slides.

If your requirements include accurate volume production of double-end work, the Model 365 New Britain chucker can be a highly efficient money-maker for you. For more information, please ask for the catalog on Model 365.

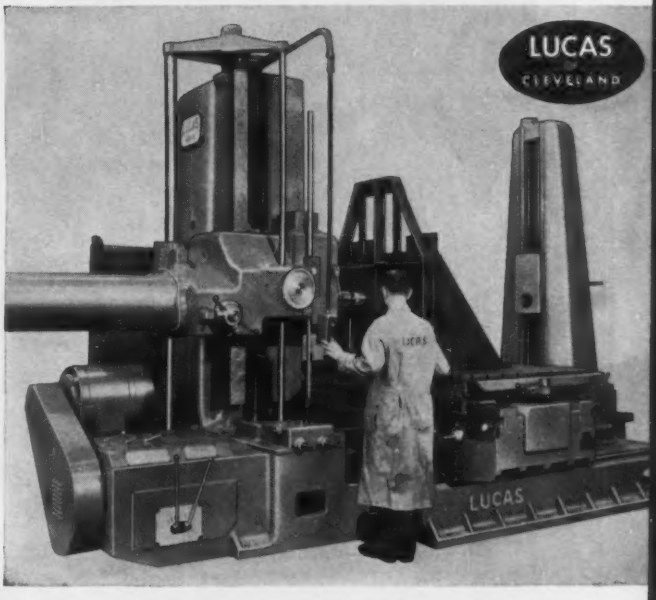




Automatic Power Positioning is a money-maker on boring machine jobs

The entire operation of setting the head and table is done through power feeds at rapid traverse speed. The operator simply inserts the proper measuring rods and starts the positioning cycle. It takes an absolute minimum of time and reduces the chance of error in locating bore centers.

Lucas pioneered and specializes exclusively in building the horizontal boring machine. The full possibilities of this multi-purpose machine are enjoyed by Lucas owners, because of the many important Lucas features and improvements — including Automatic Power Positioning, new simplified pendant control and many more. May we send you the latest descriptive Lucas catalog. Address Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.



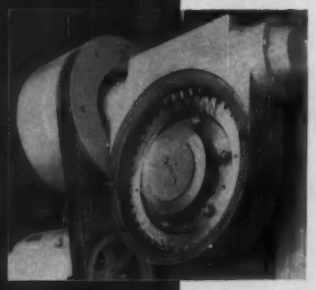
• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

See the preceding four pages for other New Britain *New's*.

Columbia
power squaring shear features



long-life gear train

Columbia's gear train is especially designed to provide maximum life with minimum maintenance.

The following features all combine to assure long life:

- Special alloys
- Bearings designed for this particular application
- Gears in operation only during cutting cycle
- Provision to reposition the worm wheel for even distribution of wear

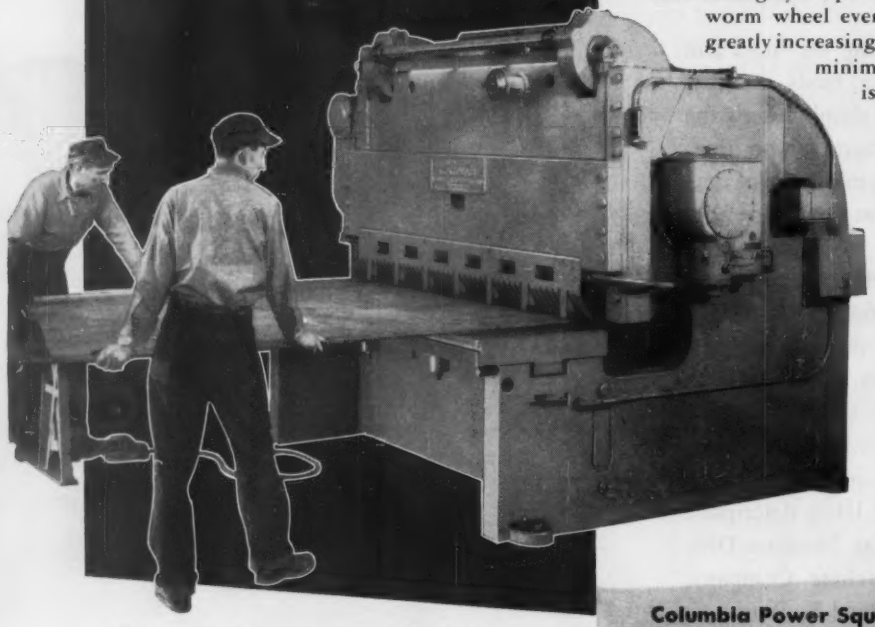
THIS COLUMBIA GEAR TRAIN ASSURES

....a SMOOTHER CUT
....a LONGER LIFE

The unusual conditions under which power is applied to a shear demand more than usual knowledge of the stresses developed in this service. From more than 100 years of experience in building heavy metalworking equipment, Columbia engineers and designers have evolved a gear train of exceptional life and capacity.

The worm shaft is of heat-treated alloy steel, supported by extra heavy duty anti-friction bearings. A specially cut high tensile alloy bronze worm gear keyed to the eccentric shaft provides smooth power to the shear ram. Since the bronze worm gear teeth are under load for only 180 degrees of each cutting cycle, periodic repositioning of the worm wheel evenly distributes the wear, greatly increasing gear train life. To further minimize wear, the gear train is inoperative except during the actual cutting cycle.

Check these and other Columbia Shear features. You get more service . . . better service . . . from every Columbia Shear.



Columbia Power Squaring Shear
Model 0806, ½" x 6'

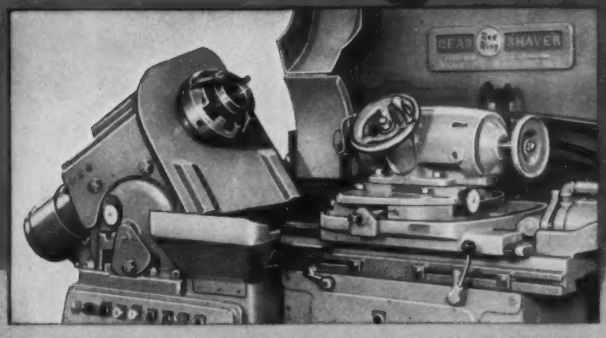
Get the complete story on exclusive Columbia Shears. Write for new FREE Bulletin No. PS-4 and the name of your distributor.

COLUMBIA DIVISION THE **Lodge & Shipley** CO. **HAMILTON 1, OHIO**

For more information on products advertised, use Inquiry Card, page 257

New Machine *Shaves* INTERNAL GEARS *Faster* and to *Closer* TOLERANCES

This new Red Ring Model "GCR" is a high production, high precision shaving machine for a broad range of internal gears. It provides two methods of shaving and many advantages which heretofore were available only on external gear shaving machines.

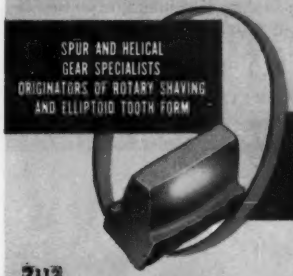


BOOTH 1215

- It will precision shave all spur or helical internals 3" to 12" PD, up to 4 diametral pitch with face widths to 2½".
- It will operate on an automatic and selective feed cycle.
- It provides the opportunity to use a new, rapid PLUNGE-CUT shaving cycle in addition to conventional shaving.
- Crowning by the Plunge-cut method is optional.
- It will taper-shave gear teeth.
- It assures precision comparable to that established by Red Ring Machines for external gears.
- It reduces loading and unloading time to a minimum.
- It handles gears having integral shafts.

When using the automatic feed cycle a selected number of cutting strokes, each with its own selected increment of up-feed, can be combined with whatever idling strokes are desired. At the end of the cycle the machine automatically stops in the proper backlash position for rapid unloading.

If your manufacturing program includes internal gears, write for complete information on this new shaving machine.



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

2113

Use WELDED STEEL for Greater Strength with Less Weight!

Illustrated above are four of fifty-eight columns fabricated, machined and assembled by Mahon for a well known press manufacturer. These and the parts and assemblies illustrated at left are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you use weldments, or if parts of your product could be produced to better advantage in welded steel, you will find in the Mahon organization a unique source with complete facilities for design-engineering, fabricating, machining and assembling. Send prints for fast action, or have a Mahon engineer call to discuss your requirements. A Booklet showing Mahon facilities and examples of superior craftsmanship will be forwarded on request.

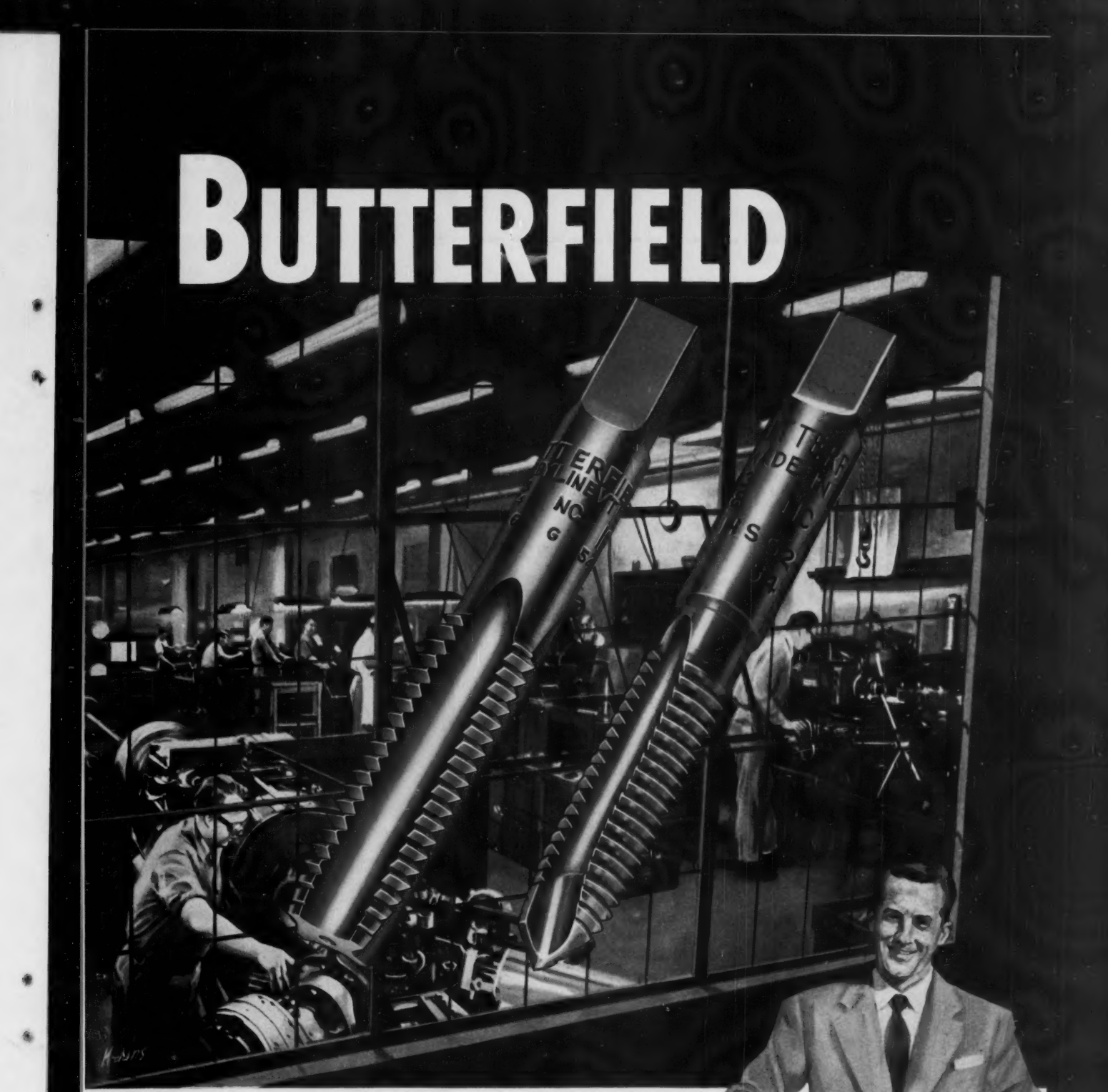
THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

For more information on products advertised, use Inquiry Card, page 257

BUTTERFIELD



A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Taps are made to the same exacting standards as Butterfield Milling Cutters, Dies, Drills, Reamers, Counterbores and End mills.

UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U. S. A.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD**
DISTRIBUTOR

wanted: more

Management men are discovering the tremendous production gains and cost savings that result from uninterrupted operation of an entire stamping line. Since Danly Presses offer *maximum freedom from mechanical failure,* lines composed entirely of Danly Presses can produce more finished stampings per shift without work stoppage, without high maintenance costs in time and labor.

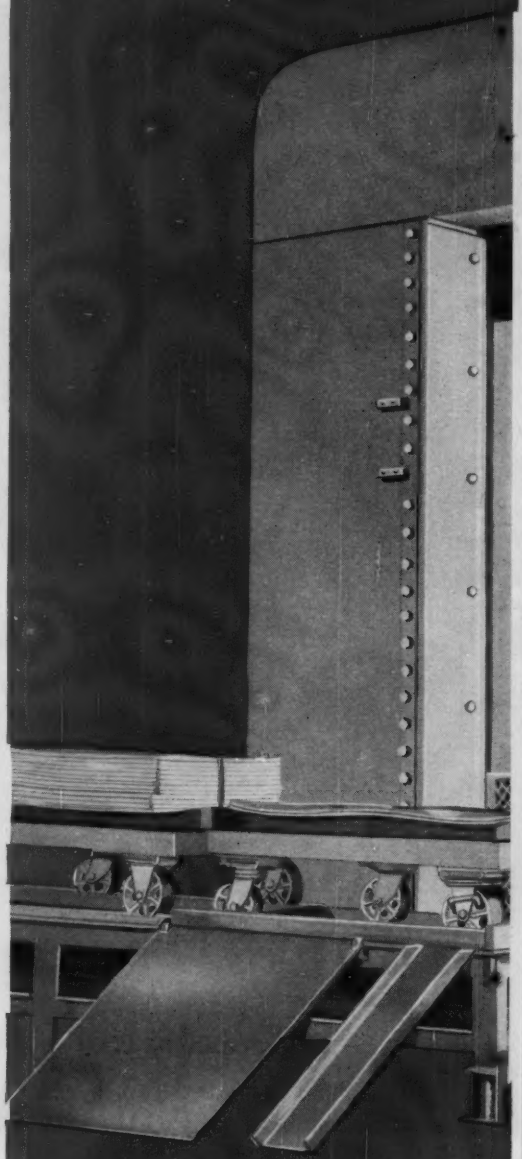
Danly Press lines actually turn out more finished stampings per hour, too. Danly Drawing Presses, pace-setters for the line, are designed with a special slide motion that doubles stroking rate without exceeding safe drawing speed. Output from these Danly Drawing Presses keeps the whole line working at full capacity.

Now—why are Danly Presses able to provide such remarkable advantages? For the most part, it's due to Danly's special design and heavier construction. Pressurized *oil* lubrication reduces maintenance by hundreds of hours every year. Heavier, more rugged construction meets day in and day out peak-load requirements. Danly's cool-running clutch and brake wear less . . . run longer before replacement. Simplified electrical and pneumatic control devices increase both operator and machine safety.

Because press downtime losses affect *your* entire production setup, it will pay to have a Danly Press engineer give you the complete story on how to lick this problem. Write or phone today.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

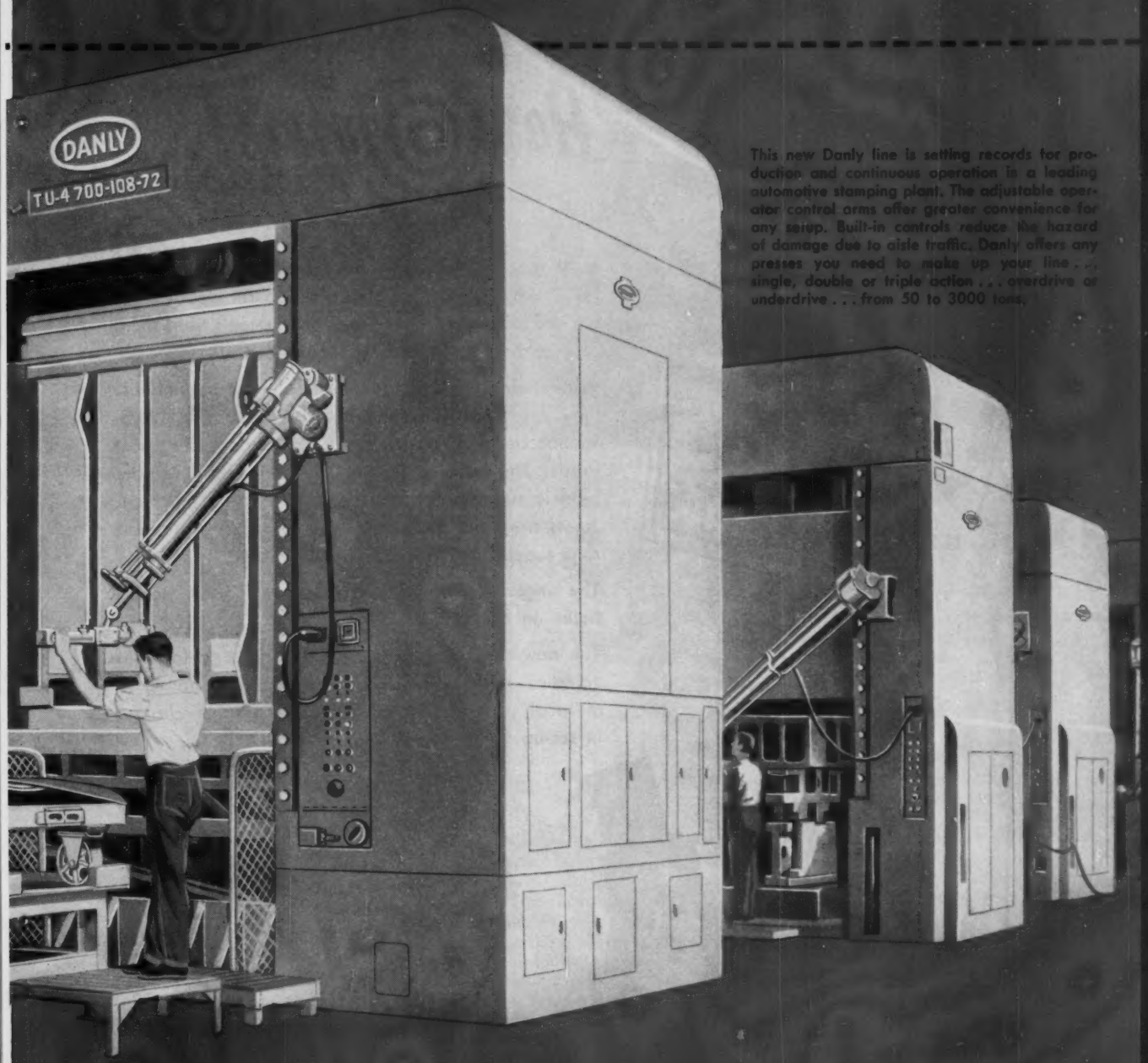
DANLY®
HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES . . . 50 TO 3000 TONS



It costs less to run a DANLY PRESS line!

specify: A NEW

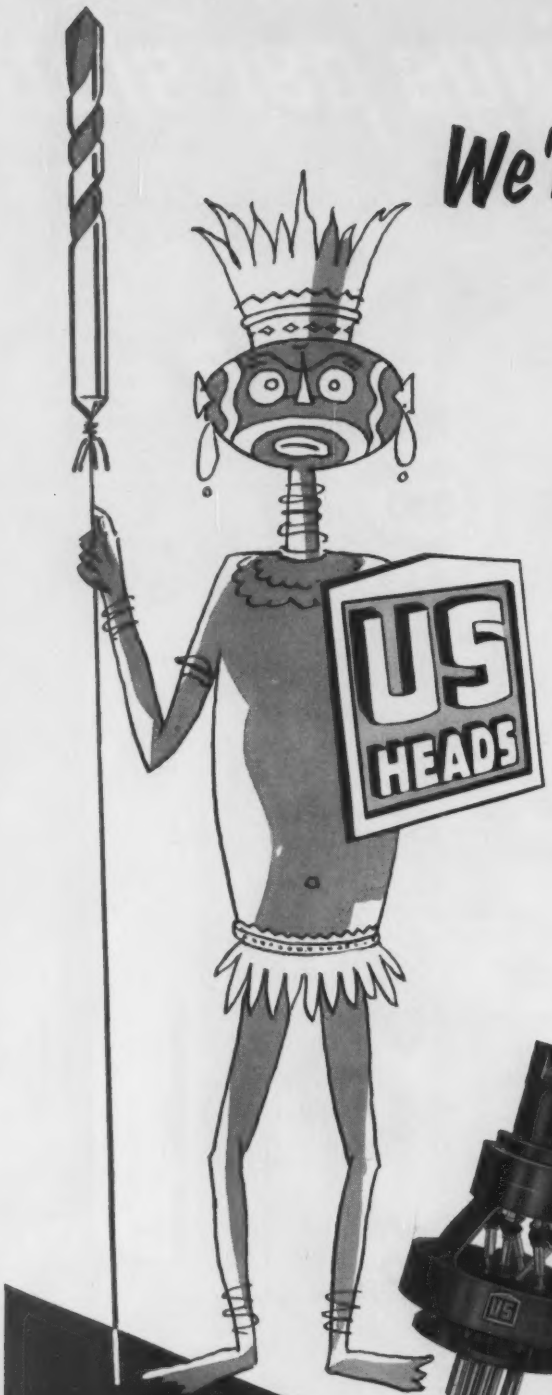
finished stampings per shift



This new Danly line is setting records for production and continuous operation in a leading automotive stamping plant. The adjustable operator control arms offer greater convenience for any setup. Built-in controls reduce the hazard of damage due to aisle traffic. Danly offers any presses you need to make up your line . . . single, double or triple action . . . overdrive or underdrive . . . from 50 to 3000 tons.

DANLY PRESS LINE

We're Looking for Head Hunters!....



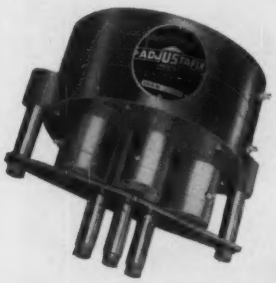
Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.

With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.

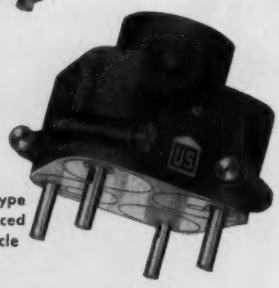
The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

Universal joint with slip spindle fixed locating plate



Double eccentric type for irregular spacing



Single eccentric type for equally spaced holes on bolt circle

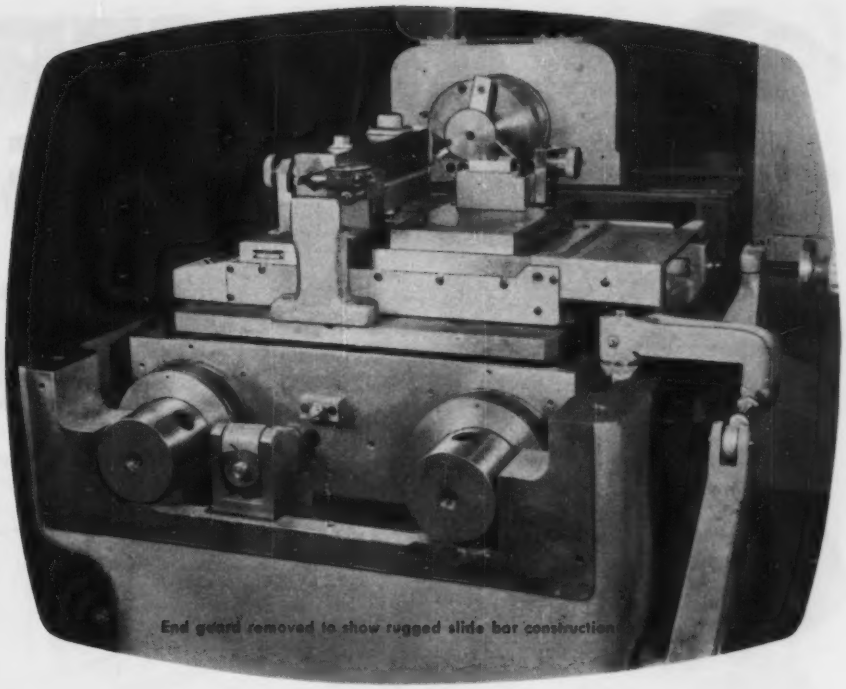
Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

UNITED STATES DRILL HEAD COMPANY

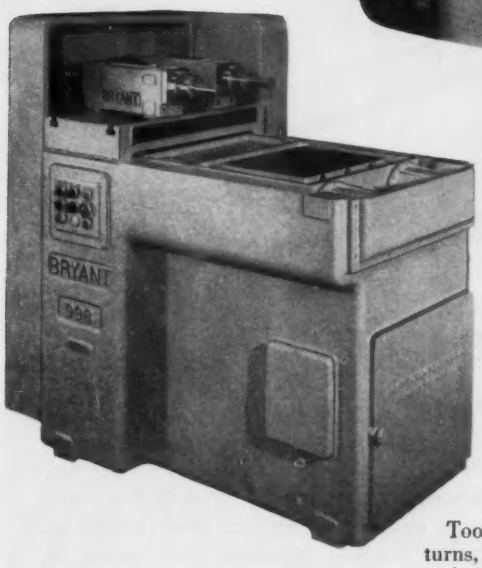
616-618 BURNS STREET • CINCINNATI 4, OHIO

For more information on products advertised, use Inquiry Card, page 257

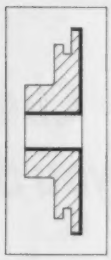
Get versatility like this...



End guard removed to show rugged slide bar construction



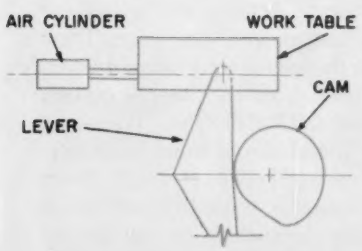
...on the BRYANT 998 precision boring machine!



Part—Gear blank, 1045 steel, 18 to 20 Rockwell "C"
Operation—Bore .4955 +.0005, 1 3/16" long
Turn 3.000 −.002, 1/8" long
Finish face
Stock removal—.007 to .010
Cutting speed—1250 R.P.M., 800 S.F.M.
Feed—5 I.P.M. on diameters, 3 1/4" to 7 3/4" on face
Lead—.004 on diameters, .003 to .007 on face
Finish required—40 to 60 micro-inches
Production—74 pieces per hour at 100%

Tooled to do five different gear blanks, the Bryant 998 shown above, bores, turns, and faces short run lots economically and with highest repetitive accuracy.

A wide range of operations—precision boring, drilling, turning, facing—plus contour turning and boring can be done at peak production rates on the Bryant 998.



The Bryant 998 is designed to allow rapid interchange of fixtures and tooling for machining a wide variety of parts. Its table is actuated mechanically by a precision cam and lever unit—providing positive control of the cycle at all times. This feature also eliminates variation due to temperature change of a hydraulic system.

The table's smooth, uniform motion assures fine finishes. The table moves on two 4"-diameter solid steel slide bars firmly bolted to the bed and is supported by two anti-friction pre-loaded ball bearings on each of the bars. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

BRYANT

chucking grinder co.

SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

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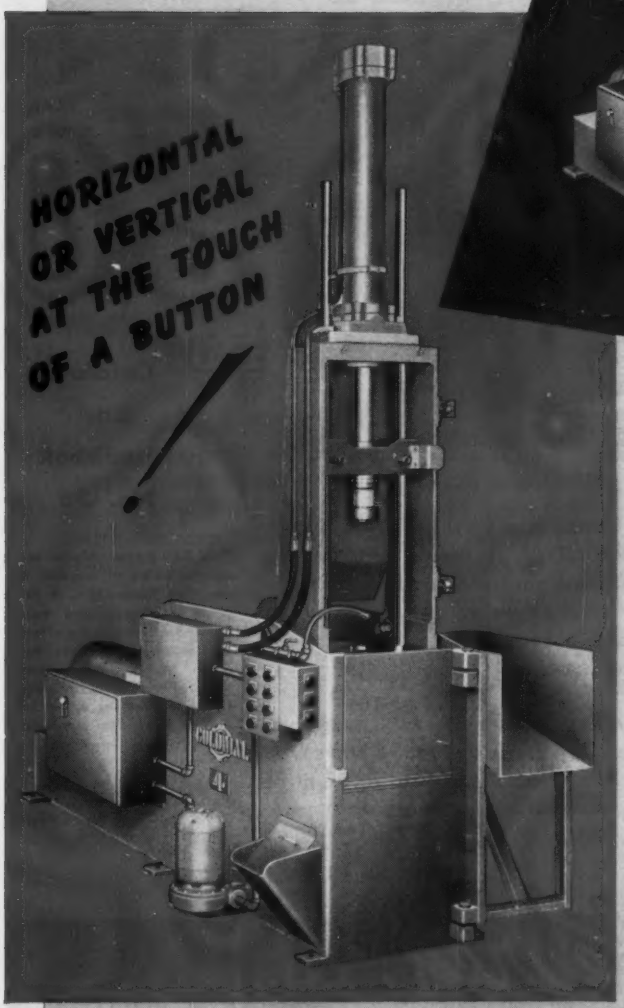
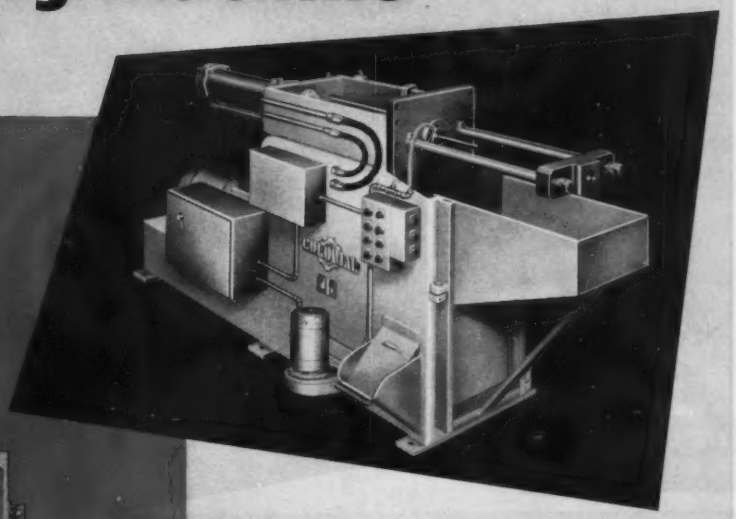
Announcing....

the COLONIAL "4" *Convertible* Broaching Machine





This amazing new Colonial "4" broaching machine is the answer for the shop that requires a broaching machine flexible enough to be changed from horizontal to vertical and back in a matter of seconds.

It is truly multi-purpose— performing any of four operations:

1. **Push broaching**
2. **Pull-down broaching** } **vertical position**
3. **Press work**
4. **Pull broaching.....horizontal position**

Rated capacity is six tons for pull-down broaching, push broaching, or press work, and four tons for horizontal pull broaching. Stroke capacity is 28" in horizontal and 24" in vertical position. Guide-bar construction maintains accurate alignment throughout the working stroke for pull-down broaching. Safety interlocks prevent tilting the machine unless the ram is retracted.

Ask for bulletin FW-55 for complete description of the Colonial "4" Convertible.

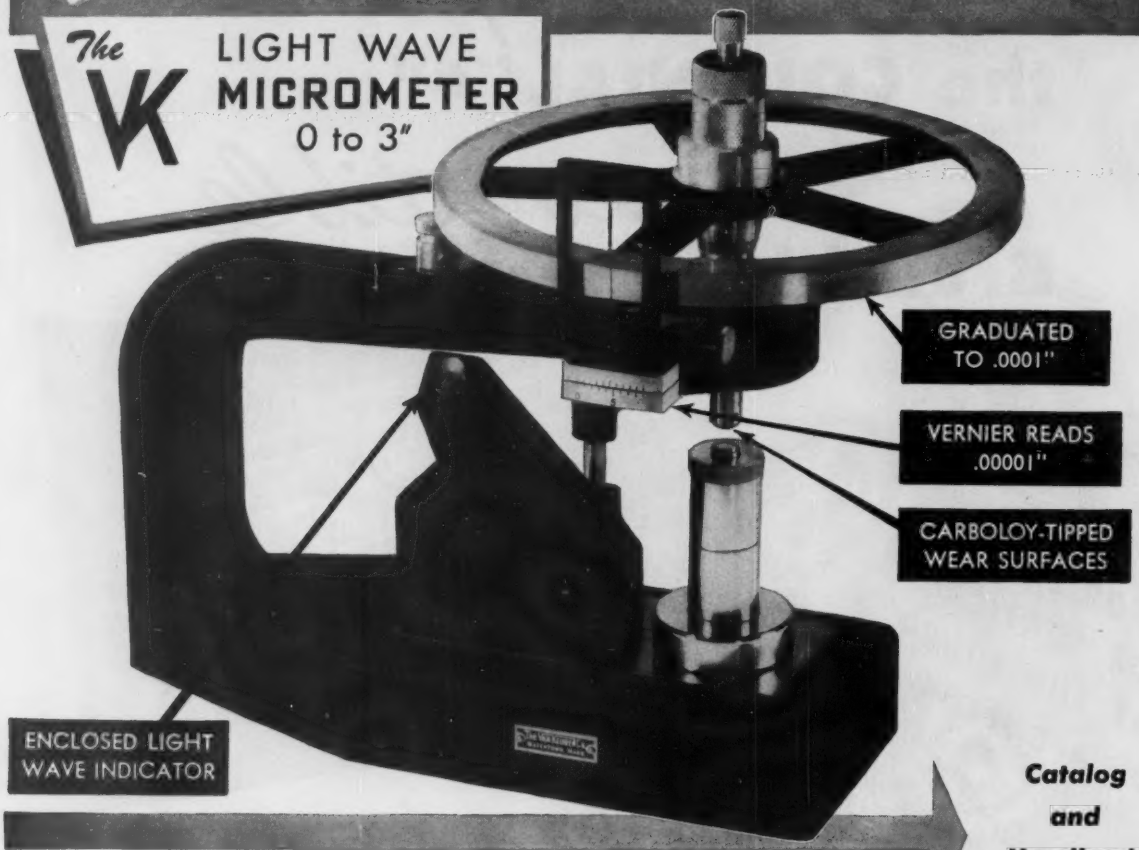
PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 12

for that last hundred-thousandth

The VK LIGHT WAVE MICROMETER 0 to 3"



Catalog and Handbook No. 35

The Van Keuren Light Wave Micrometer is an instrument of exceptional accuracy, ideal for measuring plug gages or small precision parts. Use it when you're after "that last hundred thousandth" involved in so many of today's measurements. The 0 to 3" instrument shown above has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy, and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non-parallax vernier index which enables readings to be made to .00001". It has an index lock and carboloy-tipped anvil and spindle. This sturdy, sensitive instrument weighs only 17 pounds, and is in reality a portable measuring machine of inbuilt and sustained accuracy.

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision . . . fast, accurate and profitable.

This 220-page volume represents years of research by the Van Keuren Co. It presents a simple and exact method of measuring screws and worms with wires, tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Ask for your copy . . . sent free on request by writing: The Van Keuren Company, 178 Waltham St., Watertown, Mass.

VK

36th YEAR

THE Van Keuren CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

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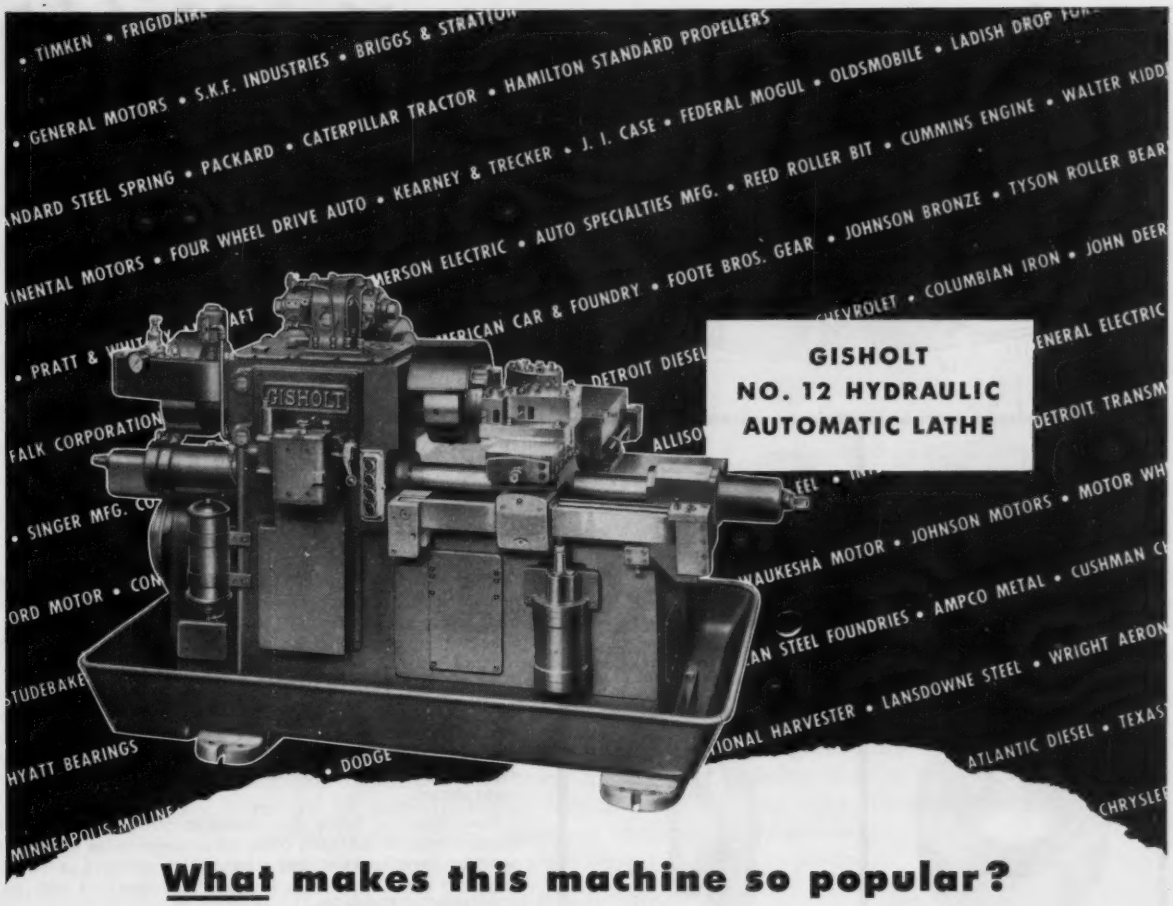


What makes this machine so popular?

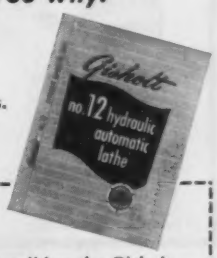
It's the simple basic application of hydraulic principles—perfected through the years. It's a single spindle machine that handles all classes of work—holding with a chuck or an arbor, with fixtures, or with a work driver for between centers. Front carriage alone will perform 14 different cycles. Independent rear slide can be positioned at any angle to the work. Feeds are infinitely adjustable...not limited by cams. Here's the versatility, the speed, the automatic cycle, and the easy change-over that mean big savings for scores of users. Why not for you?

If you have parts up to 12″ to produce at lower cost, look at the Gisholt No. 12 Hydraulic Automatic Lathe. Call your Gisholt representative. Or write us.

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

This new catalog will show you why.

All operating features are clearly described, fully illustrated. Here, too, are 28 different jobs to show many classes of work and tooling possibilities. Write for your copy.



Gisholt Machine Company
Madison 10, Wisconsin

Please send my copy of the catalog describing the Gisholt No. 12 Hydraulic Automatic Lathe.

Name.....*Title*.....

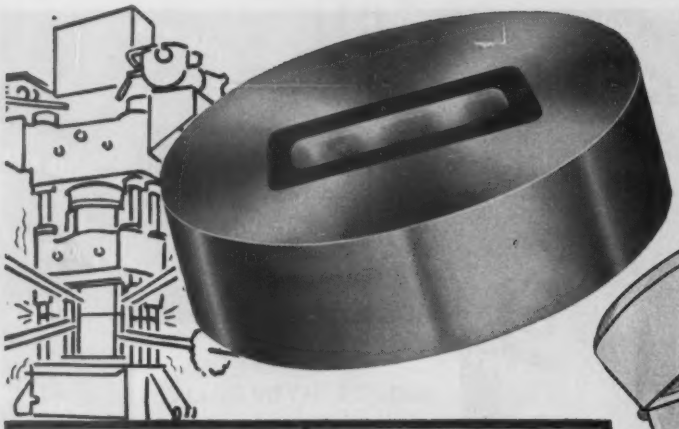
Company.....

Address.....

City.....*State*.....

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



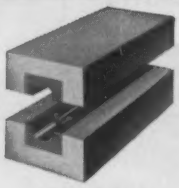
12,979,660 LIGHTER CASES WITH TALIDE DIES

A leading producer of cigarette lighter cases was experiencing considerable trouble using steel dies. An excessive number of lighter cases were being scrapped due to tears and deformation. Die cost was running $.028 per lighter. Operation involves drawing .020" thick carbon steel on A-3 Niagara presses, 45 strokes per minute.

Our die engineers were called in, and after installing specially designed Talide dies on customer's press line, rejects were eliminated, as well as time previously spent in buffing and polishing the cases after drawing. Subsequent plating expense was reduced ⅓ due to the smoother surface on the cases drawn.

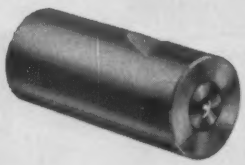
The original 15 Talide dies placed in production have now drawn a total of 12,979,660 cases for an average life of 865,310 per die. Previous steel dies produced an average of 15,000 cases per die. Die life was therefore increased 58-1 after the installation of Talide dies.

Die cost has now been reduced to $.0008 per lighter drawn, and customer estimates his saving for the past year, using Talide dies, has been at least $25,000.



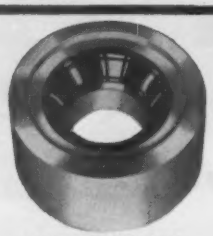
SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.



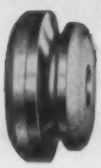
HEADING AND EXTRUSION DIES

Cold-heading ¾" carriage bolts, TALIDE dies produced 1,500,000 pieces, steel dies only 50,000.



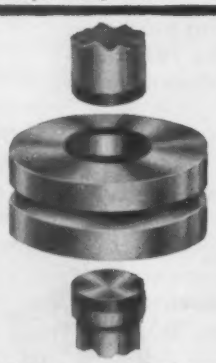
SHEET METAL DIES

137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.



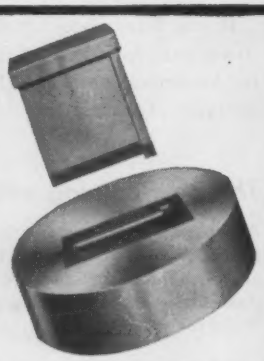
CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.



POWDERED METALLURGY DIES

Pill dies of TALIDE metal outlast steel dies 100 to 1 while reducing rejects 82%.



BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE—over hard alloy die.

IMPROVED QUALITY

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear-resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

"Year after year—you can rely on TALIDE METAL for uniform results and consistent quality."
METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 7, OHIO
HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Send for new 84-page Catalog 55-G or ask for sales engineer to call.

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Specialists in AUTOMATIC MACHINES

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

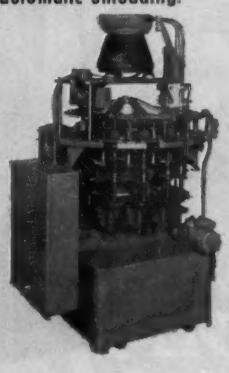
Since 1919

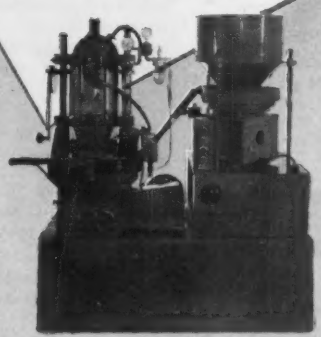
Swanson offers a fully integrated organization experienced in engineering and building special automatic machines for machining, processing and assembling small and medium parts. Illustrated are typical examples of Swanson special machines which are improving quality and lowering costs in a wide range of manufacturing operations. Because they incorporate Swanson-developed standard components wherever applicable, both time and money were saved in their completion.

If you have a problem in automation, tell us about it. We'd like to help.

Your inquiries will be treated in full confidence . . . our recommendations submitted without obligation.

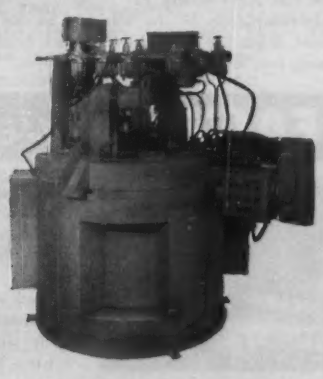
Completely automatic turret type machine for processing four electronic parts simultaneously at each index. Equipped with hopper feed, automatic chucking, transfer mechanism, Swanson-designed memory device and automatic unloading.





An automatic straight-line indexing machine, designed for injecting cement into flash bulb bases. Machines of this type have increased previous production rates by three to five times.

This special machine for drilling, tapping, reaming and counterboring cigarette lighter parts at 1200 per hour, was designed and built around a standard 8-station Swanson Turret Indexing Unit.



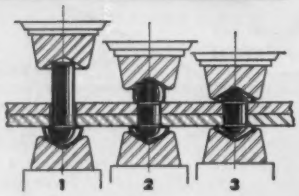
SWANSON TOOL & MACHINE PRODUCTS, INC.

814 East 8th Street • Erie, Pa. • Phone 2-6763

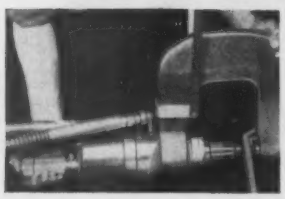
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!

This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.



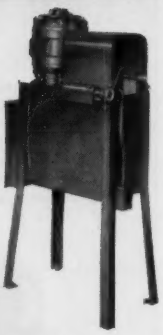
FASTER RIVETING!

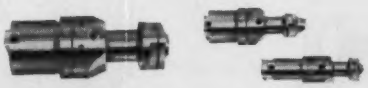


Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

QUIETER OPERATION!

Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...





...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

GET THE FACTS!

Get Bulletin 150. Learn why cost-conscious firms in many fields use "Hy-Power." Just write for your copy of this 32-page book. We'll mail it promptly.

HANNIFIN

Hannifin Corporation, 509 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

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CARD
S. W. CARD MFG. CO.
TAPS and GAGES
by Card
A select line of precision gages is now offered by Card, manufacturer of world-famous Card taps. In every industry, in every shop, these tools speed production, assure you of precision and satisfaction. The new line of gages is equal in every respect to the quality of manufacture that has made Card taps famous over the past 81 years.
Contact your local Card Distributor for prompt deliveries and helpful service.
The CARD Quality
S. W. CARD MANUFACTURING CO.
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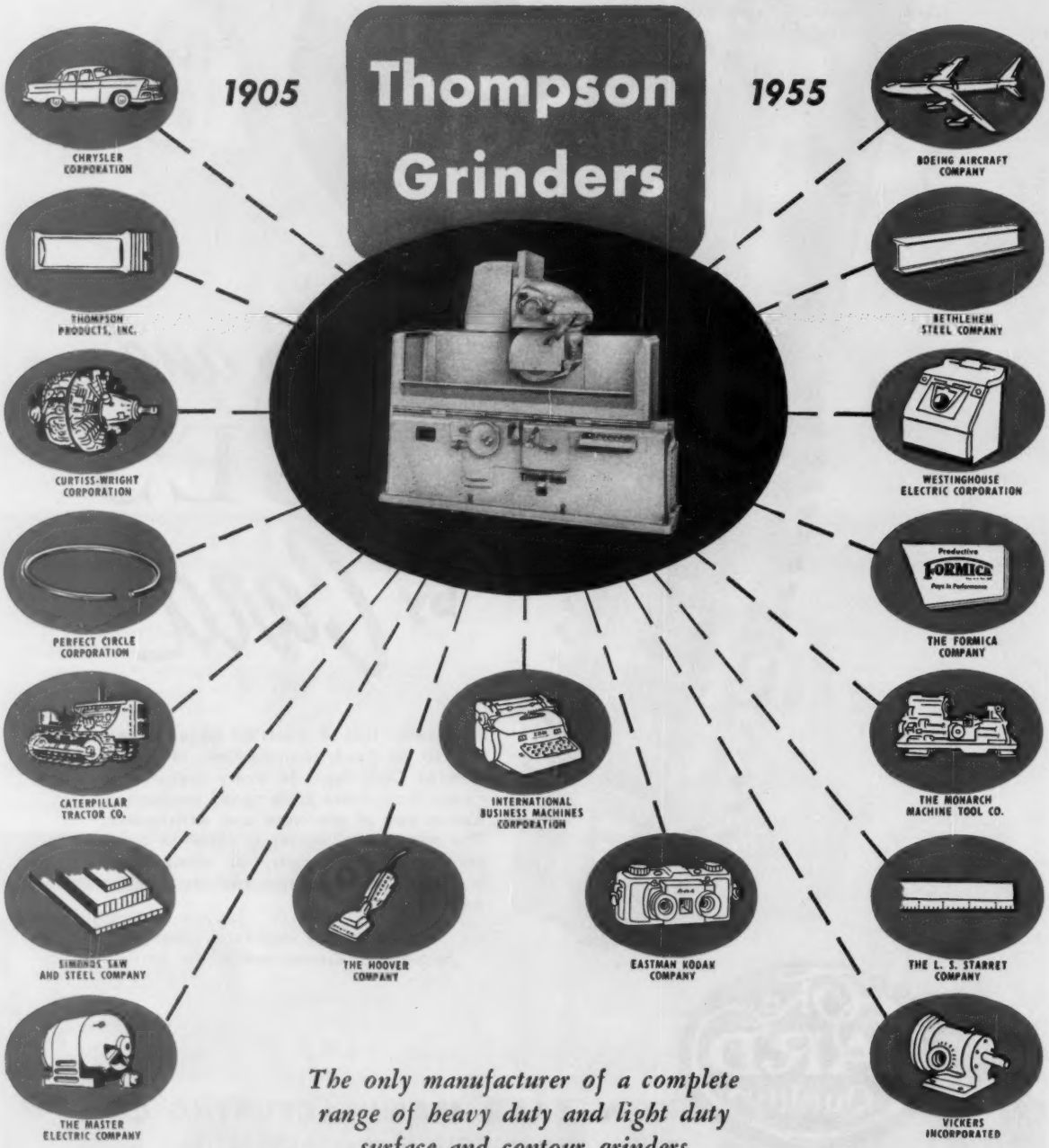
Quality Speaks

among the thousands of users of



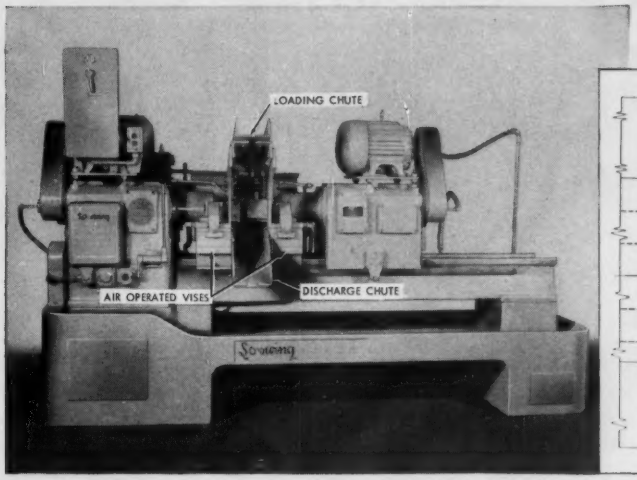
The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders

THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

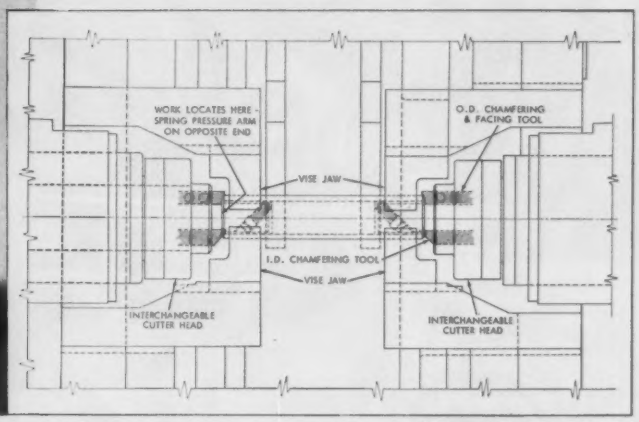
For more information on products advertised, use Inquiry Card, page 257

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



TOOLING LAYOUT


WORK LOCATES HERE - SPRING PRESSURE ARM ON OPPOSITE END
O.D. CHAMFERING & FACING TOOL
VISE JAW
I.D. CHAMFERING TOOL
VISE JAW
INTERCHANGEABLE CUTTER HEAD
INTERCHANGEABLE CUTTER HEAD

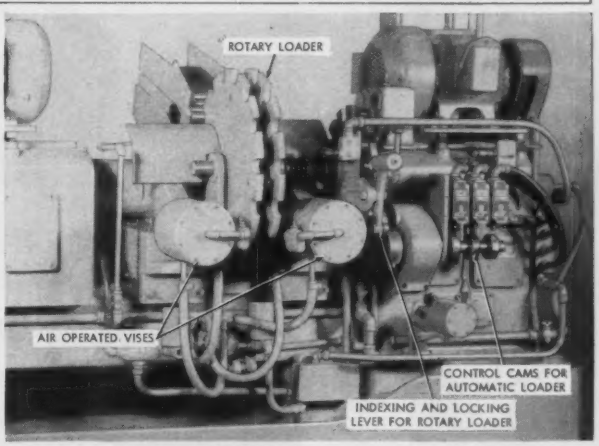
BEARING TUBES HANDLED AND MACHINED AUTOMATICALLY ON MODEL CS DRILLING AND CENTERING MACHINE

PROBLEM: To automatically load and unload Bearing Tubes, bore both ends for a depth of 1-5/8", face to length and chamfer inside and outside diameters on both ends.

SOLUTION: The Model CS Automatic Drilling Machine selected for this job was equipped with Special Rotary Type Automatic Handling Equipment and Semi-standard, Air-Operated Vises shown in the illustration.

The tubes, previously cut to length, arrive by conveyor and are fed by gravity into the rotary loader from the loading chute mounted on the front of the machine. The rotary loader is indexed in timed relation to the machine cycle and carries the parts into working position where they are clamped in the air-operated vises.

The tubes are accurately located endwise in the vises by means of a fixed stop on one end and a spring-loaded pressure arm on the opposite end. After the parts are securely clamped, the cutter



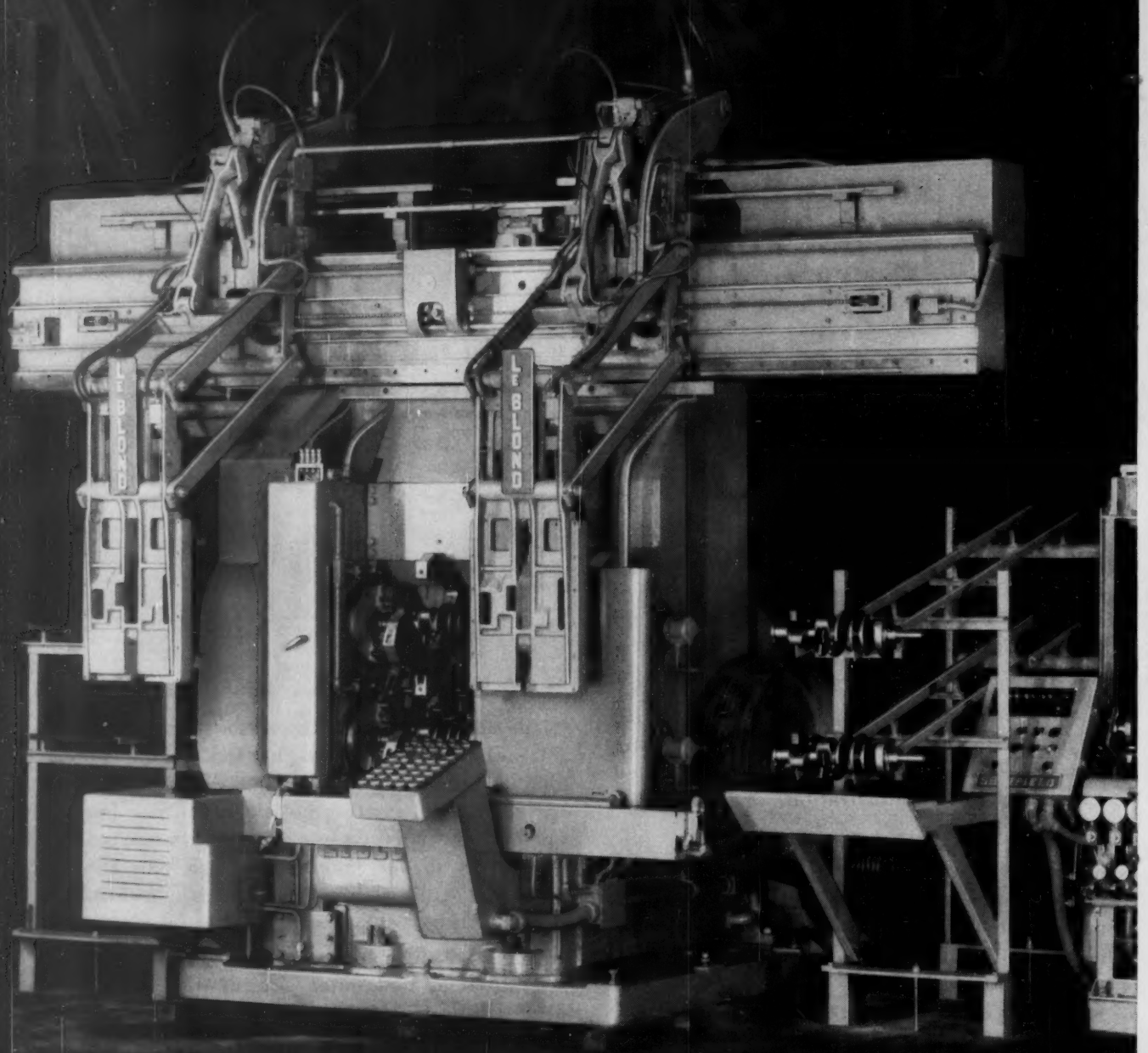
heads advance in rapid traverse, slow down to normal feed during the boring, facing and chamfering operations, and then return in rapid traverse to the starting position. The vise jaws open as soon as the tools clear the work, and the rotary loader indexes a rough part into working position while discharging the finished part into the discharge chute.

The operation is entirely automatic. One operator can look after several machines. A production of 265 pieces per hour is easily maintained. Seneca Falls engineers are at your disposal to help solve your AUTOMATION problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

FASTEST CRANKSHAFT LATHES



THE MACHINE TOOL SHOW

Crankshafts travel from right to left. The LeBlond LBA turns main bearings, flange and pilot, sprocket diameter and front end simultaneously. The automatic loader-unloader then delivers the crank to a gaging fixture where diameters of the No. 1, 3 and 5 main bearings are checked. The crankshaft is transferred to the LeBlond PBA where all the pin bearings of two cranks are turned at the same time. Note: Loading racks shown are temporary for runoff only.

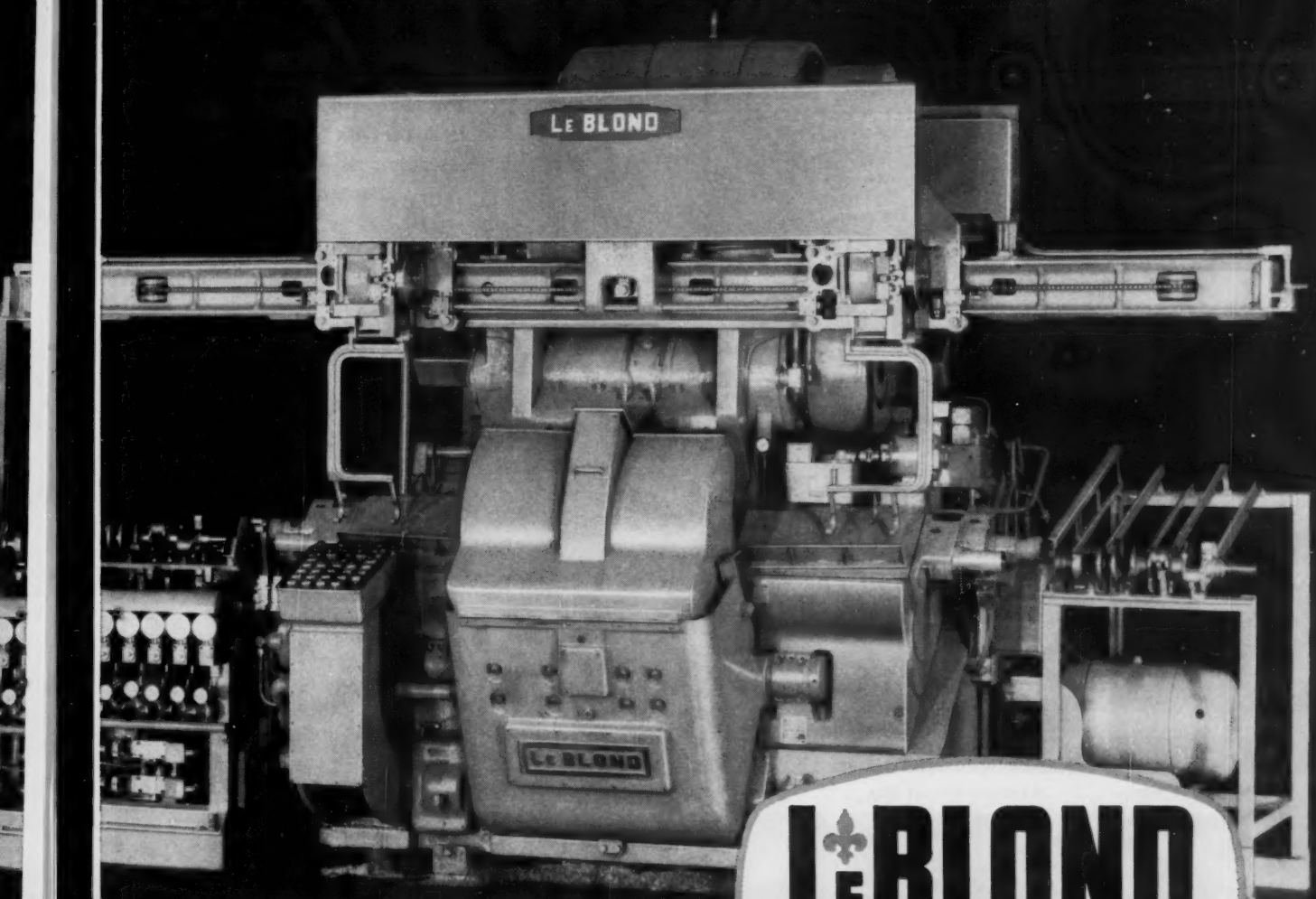
ANNOUNCED BY LeBLOND

Fifty-five precision-cast V-8 crankshafts per hour—highest production yet—are turned out by the latest LeBlond Automated Crank Turning Equipment.

The new unit consists of a LeBlond Automatic Line Bearing Center-Drive Lathe, a gaging fixture and a LeBlond Automatic Two-Spindle Pin Turning Machine. One operator can handle two such units. All turning and facing operations are completed on the crankshafts which have been prepared by spot milling and centering. Machine motions are sequenced electrically and hydraulically for continuous automatic operation.

You can benefit from LeBlond's experience as *the* pioneer of crankshaft-turning equipment over more than a half-century. Send us your crank-turning specifications for quotation.

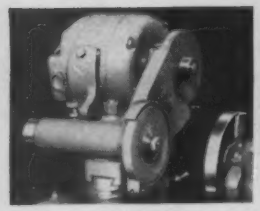
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO



....cut with confidence

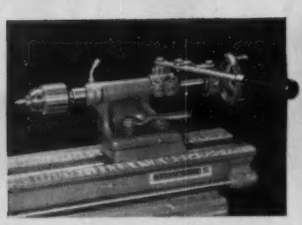
LeBLOND of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES — FOR MORE THAN 67 YEARS.

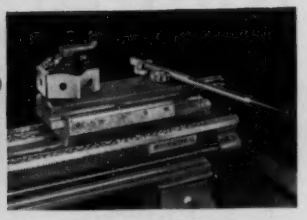


External Grinder

Milling Attachment

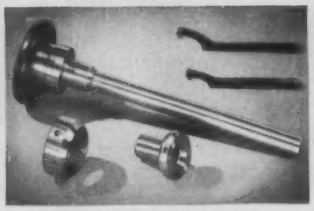


Handlever Tailstock

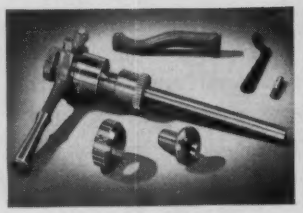


Handlever Bed Turret

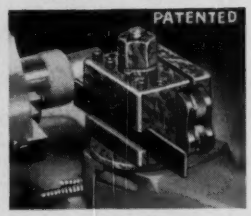
Telescopic Taper Attachment



Handwheel Collet Attachment

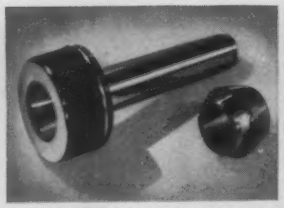


Handlever Collet Attachment

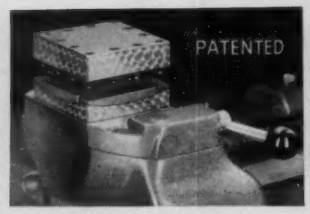


10 in 1 Tool Holder

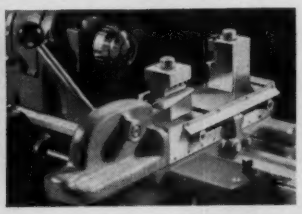
Ball Bearing Live Center



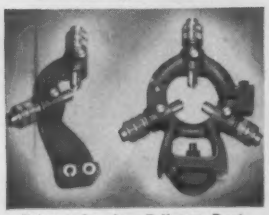
Adjustable Collet Bushing Chuck



Square Turret Tool Block

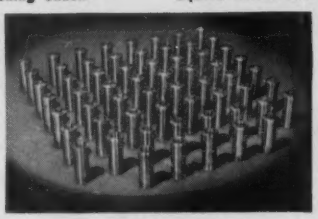


Handlever Double Tool Cross Slide

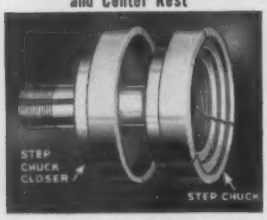


Telescoping Jaw Follower Rest and Center Rest

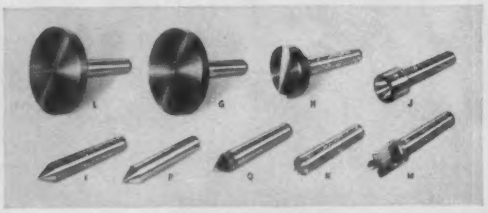
Collet Rack



Steel and Brass Collets

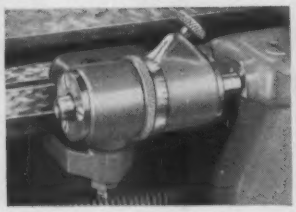


Step Chucks and Closers

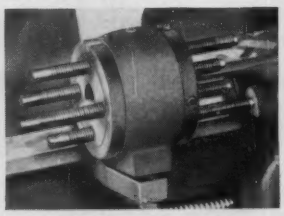


Centers and Drill Pads

Thread Dial Indicator



Micrometer Carriage Stop



Four Position Carriage Stop

SOUTH BEND

Lathe Attachments

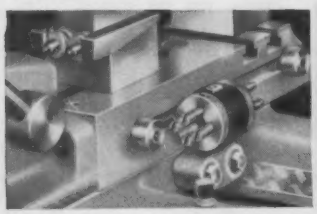
- Cut Production Time
- Simplify Difficult Jobs
- Increase Lathe Versatility
- Speed Up Tooling
- Perform Special Classes of Work
- Reduce Operator Fatigue

Write for Catalog

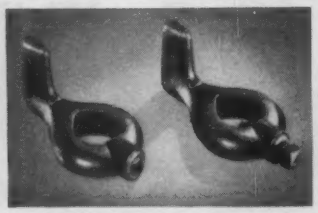
SOUTH BEND LATHE

Building Better Tools Since 1906

SOUTH BEND 22,
INDIANA

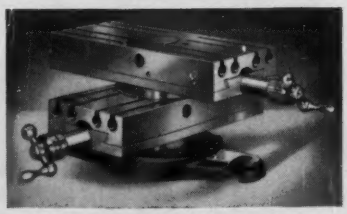


Four Position Cross Slide Stop



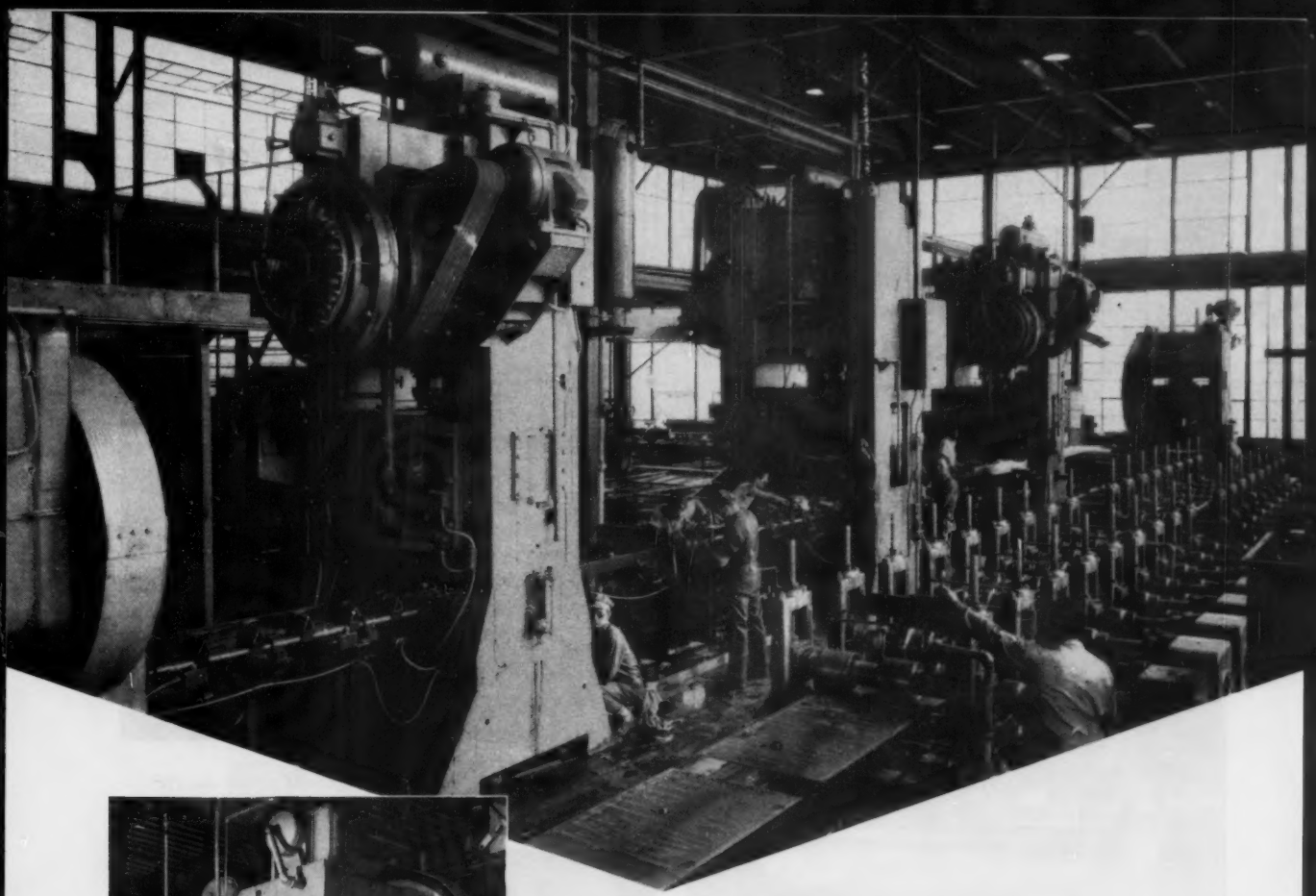
Safety and Standard Lathe Dogs

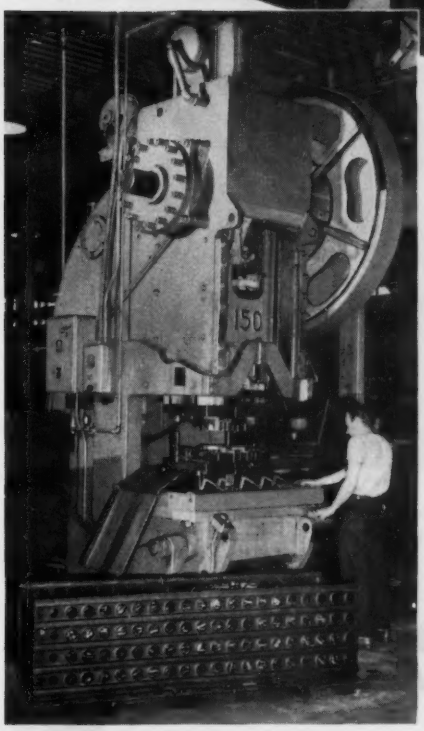
Coolant Pump



Universal Table

For more information on products advertised, use Inquiry Card, page 257





Chevron shaped mat fasteners are produced from ¼" steel on this 150 ton Clearing inclinable press.

OPERATION AIRSTRIP

Clearing Presses Mass Produce Landing Mat Sections

If you're looking for an example of modern mass production, take the job being done by Mesker Bros., Inc. in St. Louis. At peak operation Mesker runs 300 tons of steel a day through their plant in the production of landing mat sections. The operation is performed with economy of handling and speed that takes full advantage of the working capacity of their line of Clearing presses.

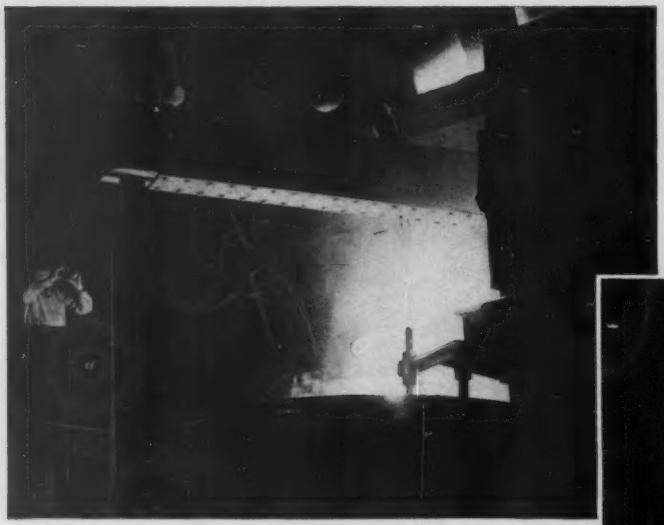
If you have a problem concerning press metalforming, call on Clearing engineers for a solution that will gear your production up to its top potential.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION DIVISION OF U. S. INDUSTRIES, INC.

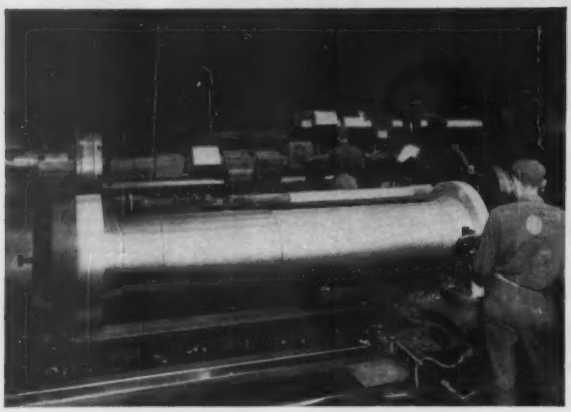
6499 WEST 65th STREET, CHICAGO 38, ILLINOIS • HAMILTON PLANT, HAMILTON, OHIO

HERE'S THE STORY OF YOUR FORGINGS AT NATIONAL FORGE AND ORDNANCE CO.



1. Basic Electric Steel is made for all forgings.

2. Forgings are made from Ingots of proper size for the best final result.



3. Forgings are rough-machined before heat treatment to insure greatest uniformity.

4. The heat treating equipment is adapted to the job to be done.

5. National Forge can make your forgings—large or small—rough or finished.

6. Precision is a by-word at National Forge.

Write for new Bulletin giving detailed information on National Forge Facilities

NATIONAL FORGE AND ORDNANCE CO., IRVINE, WARREN CO., PENNA.

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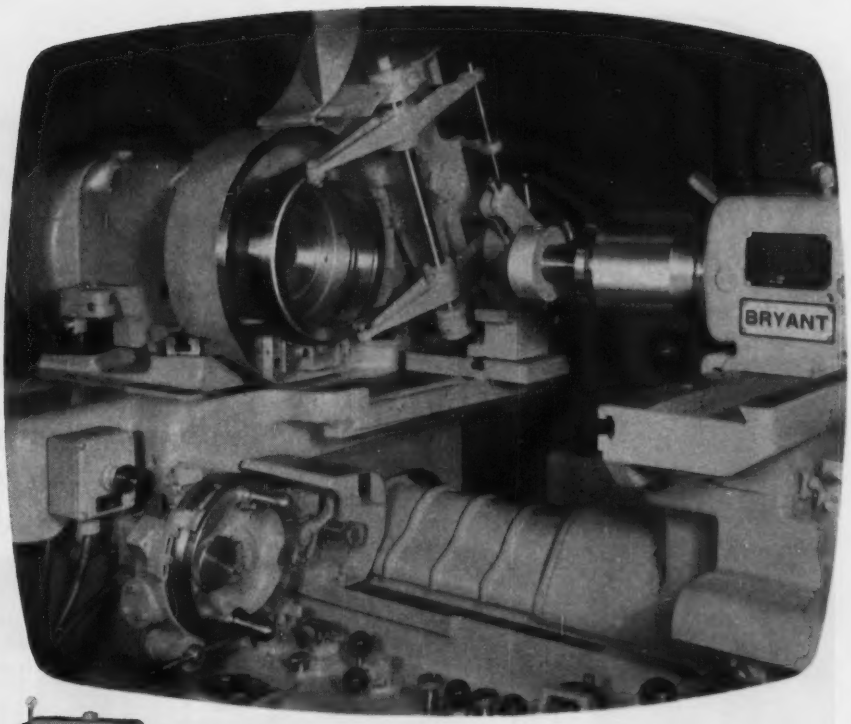
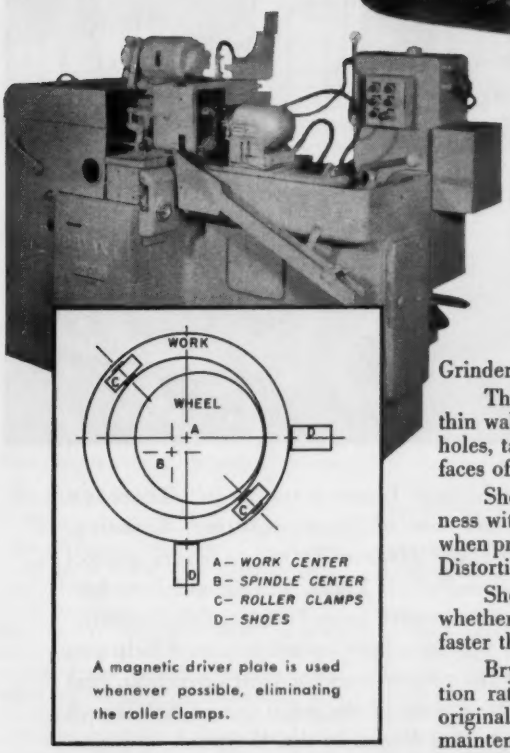
SHOE CENTERLESS GRINDING WITH...





A magnetic driver plate is used whenever possible, eliminating the roller clamps.

BRYANT internal grinders gives you HIGHER PRODUCTION and LOWER COSTS

Experience-proven tooling and fixtures help make Bryant Internal Grinders exceptionally accurate . . . efficient . . . productive.

The shoe-type centerless internal grinding fixture is typical. Extremely thin wall rings can be shoe centerless ground to close tolerances. Straight holes, tapered holes and contours, having cylindrical, conical or other surfaces of revolution can be ground by this method.

Shoe centerless grinding ensures bore grinding to a uniform wall thickness with concentricity held to less than .0001". It is particularly successful when previous O.D. and face grinding operations have been closely controlled. Distortion caused by conventional clamping is eliminated.

Shoe centerless grinding speeds up loading and unloading of work parts, whether manual or automatic. Change-over from job to job is easier and faster than with conventional grinding fixtures.

Bryant grinders offer you operating economy—as well as peak production rates. Their adjustable precision alignment helps ensure maximum original accuracy throughout their lives. They require only a minimum of maintenance. Factors like these cut cost per piece.

***WRITE** for our "Alignment" booklet. Ask, too, for a reservation card for our sound, color movie, "Alignment for Better Internal Grinding"—free showings arranged for engineering groups.*

BRYANT

chucking grinder co.

SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

AROUND-THE-CLOCK OPERATION SIX DAYS A WEEK

Texaco Cleartex Oil Does a Great Job for Teale Machine Company, Rochester, New York

For the past five years, Teale Machine Company, Rochester, New York, has been using *Texaco Cleartex Oil AX* as machine lubricant and cutting oil. Machines run twenty-four hours a day, six days a week — cutting brass, monel, free machining and stainless steel. Results have been —

— more pieces per tool grind
— better finish
— lower unit costs

Better, faster machining at lower cost is the rule wherever Texaco is on the jol There is a complete line of *Texaco Cutting, Grinding, Soluble and Hydraulic Oils* to assure perfect machining of all kinds, and smooth, trouble-free performance from hydraulic equipment.

Let a Texaco Lubrication Engineer help you select the proper ones for your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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TEXACO **TEXACO** **CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS**

TUNE IN . . . TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on television . . . Saturday nights, NBC.

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By LORING F. OVERMAN

New Commission for Industry Dispersal

BY mid-March, Washington was mulling over the prospect of another alphabetical agency. In this instance, its initials had not been agreed upon, but the agency under consideration was a "Hoover type" commission, to submit recommendations on industry dispersal. Up to the present, half a dozen defense-connected agencies have been wrestling with the problems involved. The need for such a commission—to be ready for work by May 15—was proposed to the Civil Defense Sub-Committee of the Senate Armed Services Committee by Dr. Arthur S. Flemming, Defense Mobilization Director. Legislation authorizing its creation was introduced by Senator Wallace F. Bennett (R-Utah).

A commission of the type contemplated would be of vital importance to the machinery and manufacturing industries. Where future plants are to be located; where machinery is to be produced and stored; and even, what kinds of machines are required in the years ahead, typify the subjects that would come up for consideration. Thus, one agency would be a clearinghouse for such problems.

Dispersal to Where?

Ever since the first atom bomb was dropped, defense plans have been in a state of complete reappraisal. One early requirement was that proposed defense facilities be set up not less than 10 miles from the perimeter of specified target areas. These were based on the reports of damage at Hiroshima and Nagasaki, where the bomb used was reported to have had an explosive capacity of 20 kilotons. New computations reveal that a 5-megaton bomb will destroy everything within a 6.3-mile radius, and leave substantial damage within a 12-mile radius.

These estimates do not include the ominous destruction from "fall-out"—the rain of radioactive material many hours after a thermonuclear explosion. Release of the Atomic Energy Commission's report that "fall-out" damage following the Bikini tests indicated the possible contamination of an area of 7000 square miles was the motivating factor behind the proposal of Dr. Flemming for the new commission.

Any analysis of the seemingly insurmountable problems raised by attempts to anticipate a thermonuclear attack, and to prepare a defense against such an emergency, suggests the conclusion that there is really only one defense. That lies in making as certain as possible that such an attack never comes. It is reasonable to conclude that the winners in an atomic war will inherit only chaos. Then somewhere along the line there must be ground for a logical compromise—just as there has been a truce in the use of poison gas. The fear that "someone" would use gas has continued since World War I, but no one has seen fit to open the first valve. Surely, international sanity should also outlaw atomic weapons.

Armed Services Tools

The United States Air Force was reported in March about ready to order some of the $84,500,000 worth of machine tools it was authorized to buy with Vance Committee funds. An initial order of $15,000,000 was said to be ready for placement. The equipment purchased would be used to fill gaps in the USAF's requirement for long-lead-time machine tools. Delays in getting the present Vance program under way have been due to uncertainty as to how much money this branch of the service would be alloted, and then, as to what type of tools would be most needed in the foreseeable future. The Bureau of Ships of the United States Navy has announced plans for a survey of its $150,000,000 inventory of machine tools, to be followed by a five-year program of modernization and replacement.

All branches of the service concede that buying the right machine tools is difficult, but that making certain they will be available when needed (and still be the right machine tools at such a time) is a Herculean problem. Where, for example, would be a safe place to store reserve machines? Both the Army and the Navy are considering storing them in mines and caves. Expenses of such a plan, and difficulties in transporting the equipment to points of use in time of need, are valid objections to be considered.

On the other hand, the Air Force cautions that its present storage depots are extremely vulnerable. Advocates of mine and cave storage point out that maintenance costs are low, that humidity is not a problem, and that the areas could also accommodate other technical and scientific equipment. Meanwhile, no proposed solution to the storage problem has been approved.

Washington Briefs

Expansion Authorization Asked—Authorization for the armed services to continue stockpiling machine tools and other equipment, and to expand defense productive capacity, is asked in Senate Bill 1138. Introduced by Senator Richard Russell (D-Ga.) and co-sponsored by Senator Leverett Saltonstall (R-Mass.), the measure would extend the authority granted under the original law passed on July 17, 1953, until July 1, 1956, or until the end of the national emergency, whichever is earlier. The legislation requires the Senate and House Armed Services Committee to review budget requests for the purchase of machine tools and related equipment. Under existing law, the Secretaries of the Army, the Navy, and the Air Force may acquire privately owned plants or enlarge facilities and stockpiles already maintained by the Government.

New Division Chief—Ralph R. Baldenhofer, executive vice-president and treasurer of the Thompson Grinder Co., Springfield, Ohio, is acting for six months as chief of the Metal-Working Equipment Division of the Business and Defense Services Administration. Mr. Baldenhofer succeeds Graham E. Marx, vice-president and general manager of the G. A. Gray Co., Cincinnati, Ohio.

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MACHINERY
APRIL 1955

By Truth and by Service to Enrich Mankind

TECHNOLOGICAL proficiency lies in the ability of engineers to apply, in practical fashion, the discoveries of research laboratories in the scientific world. Engineering accomplishments in this respect have had a profound influence on the efficiency of manufacturing plants and, therefore, on the standards of living throughout the nation. In practically every area of industrial activity, except where the element of human judgment cannot be replaced, mechanisms and machines invariably are instrumental in providing more goods and services.

Seldom is high praise extended to the members of the engineering profession. The results of their efforts are taken for granted. True, a Goethals or a Westinghouse will be accorded honors, but who knows the names of the engineers who designed and produced the automatic transmissions for our automobiles, the Diesel-electric engines that have widely supplanted steam locomotives, or the vast variety of military equipment that helped to win the last war.

The American Society of Mechanical Engineers is, this year, celebrating its seventy-fifth anniversary. This is, therefore, an appropriate time to congratulate the members of that organization upon their achievements as they have toiled, generally unheralded, in their daily occupations, and to acknowledge their contributions to the development of the profession.

During its existence, the American Society of Mechanical Engineers has expanded from a handful of men to a membership of 40,000 qualified engineers, not counting a substantial number of student members. The professional stimulus given engineers by the Society's many and varied services has had an incalculable influence on the nation's industrial enterprises, on its educational systems, and on the general welfare of the people.

The slogan adopted for this jubilee year—"By Truth and by Service to Enrich Mankind"—epitomizes the guiding spirit of the past membership and presents a continuing challenge to today's and future members. It also provides an inspiration for the several thousand college students who are now preparing themselves for a lifetime of engineering activity.

Charles O. Herb

EDITOR

What's New

IN STEEL FROM STOCK

In the news today are many developments of interest to those who specify, buy or work with steel. Ways in which you can raise efficiency and lower costs in your operations may be suggested by the following summary.

7½¢ per lb. saving on stainless sheets. Rising nickel prices are bringing back Type 430 straight-chrome stainless for mild corrosion applications. 7¼c price advantage is real inducement and Type 430 may also be getting consideration as insurance against any shortage of nickel-bearing types. Ryerson has anticipated renewed demand by stocking Type 430 sheets in many gauges and sizes. Technical data on request.

Low carbon plates for easy forming and welding. If you've had trouble forming or welding carbon steel plates remember—steel produced to most popular warehouse plate spec. (ASTM A7) may have up to .35% carbon. To meet this problem, Ryerson now carries plates (⅝" and lighter) produced to low carbon spec. especially for good forming and welding qualities. Also on hand: more sizes—more tonnage of carbon steel bars, shapes and sheets.

Revolutionary reduction in shop costs brought about by Ryerson's New Rycut 50 is the most important news to hit the alloy steel market in years. With this new .50 carbon leaded alloy, reductions in finished part costs of 25% or more are commonplace. Machining time is often reduced as much as 75% . . . tool life extended from 100% to 300% and production increased as much as 200%—all without known loss in mechanical properties as compared with standard alloys in the same carbon range.

A leaded alloy for every application is now available in the Ryerson Rycut series. Any one of them will typically cut your costs on machined parts by 25% or more. Use Rycut 20 when you need a carburizing alloy. Use Rycut 40 when you need a .40 carbon alloy, and New Rycut 50 for .50 carbon alloy applications. Also on hand in a growing range of sizes: leaded carbon-manganese bars—low carbon, suitable for case hardening, unusually fast machining.

New Ryerson stainless solves welding problems. Both stainless sheets and stainless plates in Type 304 L and Type 316 L have recently been added to the nation's largest stainless stocks—at Ryerson. In applications involving welding and stress relieving, where carbide precipitation may occur, these extra-low-carbon stainless steels can often replace expensive stabilized types.

Save 30% with Type 302 ornamental stainless tubing. Another recent addition to Ryerson stocks, this tubing is priced substantially below comparable stainless tubing for other than ornamental purposes. Yet it is more than satisfactory for many applications such as in restaurant and hospital equipment, etc.

Same day deliveries . . . tighter quality control. On as high as 98% of all regular warehouse orders, Ryerson is now cutting and shipping steel the same or following day. And this steel is now protected by a whole new set of quality control standards. As evidence—we can furnish a certificate of analysis or a mechanical properties report for every pound of steel shipped.

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MACHINERY
Vol. 61 No. 8
April, 1955

By EDGAR ALTHOLZ
Associate Editor

WHY SUPERFINISH?

Surface wear persists as one of the most universal problems in the entire phenomena of mechanics. More often than not, the useful life of a component is limited by surface wear rather than by breakage

SUPERFINISHING today is firmly established as an antidote for surface wear. Developed by the Chrysler Corporation in 1936, the process has been undergoing a constant state of refinement and adaptation to a variety of industries.

In principle, Superfinishing is an abrasive technique employing a stone which has an area contact with the work. In the case of a cylindrical object, as in Fig. 1, the stone is curved to correspond to the surface of the work. The stone is under a mild, flexible pressure and oscillates rapidly, with the work revolving relatively slowly. For a typical application, the applied pressure is from 20 to 30 pounds per

Fig. 1. (Right) In Superfinishing operations, the work revolves and the abrasive stone oscillates against it under mild pressure.

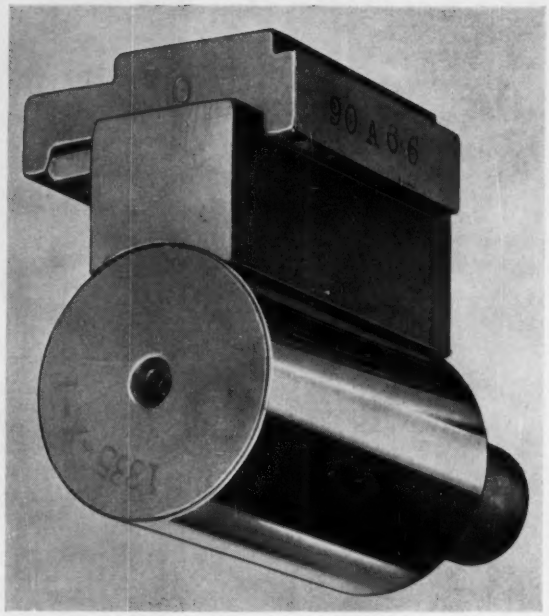
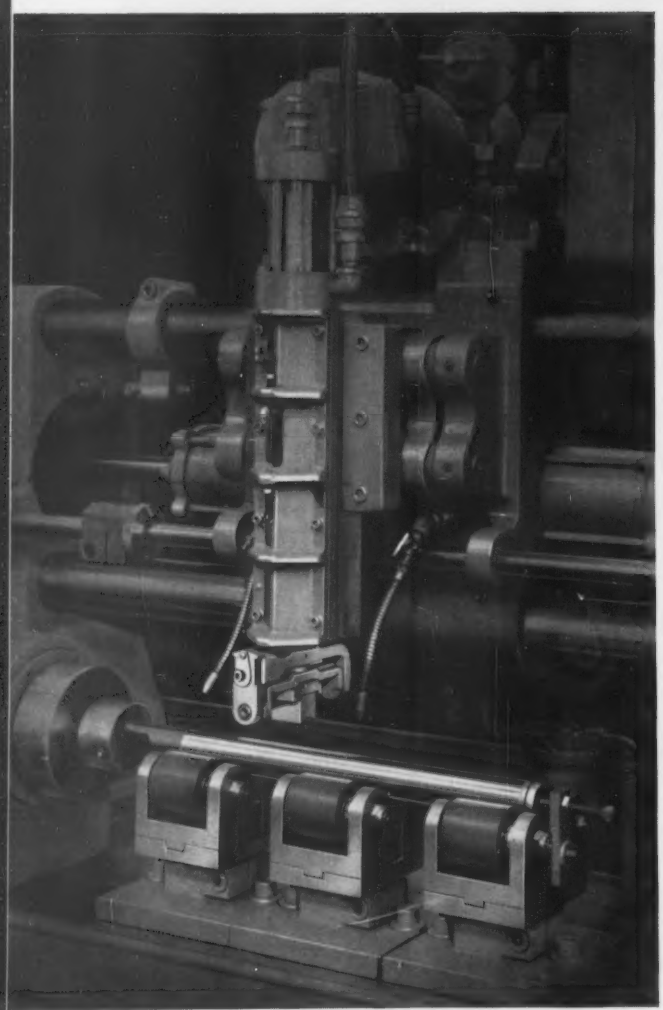


Fig. 2. (Below) Superfinishing the plunger gives it a cross-hatch pattern which greatly reduces packing-gland wear.



square inch of area, the oscillation amounts to 3/16 inch at a rate of 800 strokes per minute, and the work revolves at a surface speed of 50 to 150 feet per minute. A lubricant is used to help the cutting action of the grits in the stone and to wash away abraded particles.

The oscillation produces a cross-hatch pattern which, depending on the stone grit and the length of cycle time, can be controlled to produce the desired degree of surface finish. Stones are available up to approximately 4 inches in length. When the work length exceeds that of the stone, it is necessary to impart a traverse movement to the stone or the work—at a non-critical speed —to complete the cycle.

To Superfinish planes and spherical shapes, basic variations in the relative movements of the stone and the work are involved, yet the principle remains the same. Various types of general-purpose machines and specialized machines have been developed for Superfinishing. Also, attachments for performing the process on lathes or grinding machines are in widespread use.

Technically, the term "Superfinishing" is slightly misleading, since something more than the production of a low micro-inch surface is involved. In its principal use of refining ground bearing surfaces, the process attains other important objectives as well. First, the surface geometry of the work is improved by the removal of pitch defects—both short-pitch defects such as grinding ridges, and long-pitch defects such as chatter marks, feed spirals, grinder flats, and other waviness caused either by inaccuracies in the grinding machine or by the heat and violence of the stock removal. In contrast to the line

contact and hardness of the grinding wheel, the area contact and relative softness of the stone permit it to "wear in" to the average radius of the work. No individual defects in the ground surface appreciably affect the curvature of the stone, which acts as a master surface, reproducing its true shape in the work.

Secondly, Superfinishing increases the effective bearing area by removing the metallurgically inferior layer of smear metal produced in grinding. Extremely high surface temperatures, reportedly ranging from 1300 degrees F. to the melting point of steel, have been observed at the leading edge of the grinding wheel on the line of contact. Naturally, any heat-treatment previously given the work will be altered. The depth of burn may be from one ten-thousandth to several thousandths of an inch. Besides, the inefficient negative angles of the grits in the wheel distort the crystalline structure of the metal, tearing the surface. Partly loosened splinters of metal break away during the early operation of the bearing, causing abrasion and dimensional loss. The heat generated by a fine-grit, hard-bond wheel can produce a plastic flow of the ridges formed in rough-grinding, from the peaks into the valleys of the surface.

Residual surface stresses are another detrimental result of the heat of grinding. When the line of contact is heated, the metal tends to expand, but its colder interior will not allow any but directly outward expansion. Unable to expand either sidewise or lengthwise, the metal is instead upset, and when later cooled, is stressed in tension since it tends to become shorter than it was originally. A crazed, or cracked, surface is often the visible indication of the presence of these stresses. Sometimes the stresses are embedded in the surface layer and are apparent only after they are exposed by Superfinishing.

Packing-gland wear can be reduced considerably by Superfinishing the reciprocating member. Here, the cross-hatch pattern characteristic of the process encourages the lubricant to cling to the surface. Also, this "co-directional" finish prevents any tendency of a gland and a shaft to weld.

In the Superfinishing cycle, the stone at first contacts only the higher peaks of the metal. If the correct bond hardness of stone is in use, the stone will at this point break down to some extent, since the actual area of contact is still small. New and sharp grits are thus exposed, and they reduce the peaks rapidly. As the surface gets smoother, the area of contact increases; and so the grits, not being readily dislodged, tend to dull.

Smaller bits of metal are removed until they become so tiny that they are embedded in the stone face. This glazed condition of the stone produces a highly reflective surface. When the stone is applied to a subsequent work-piece, the peaks will break down the glazed face, so that it becomes unnecessary to dress the stone.

A recognized exponent of Superfinishing today is the Gisholt Machine Co., Madison, Wis. This company produces an extensive line of Superfinishing machines and has a laboratory where

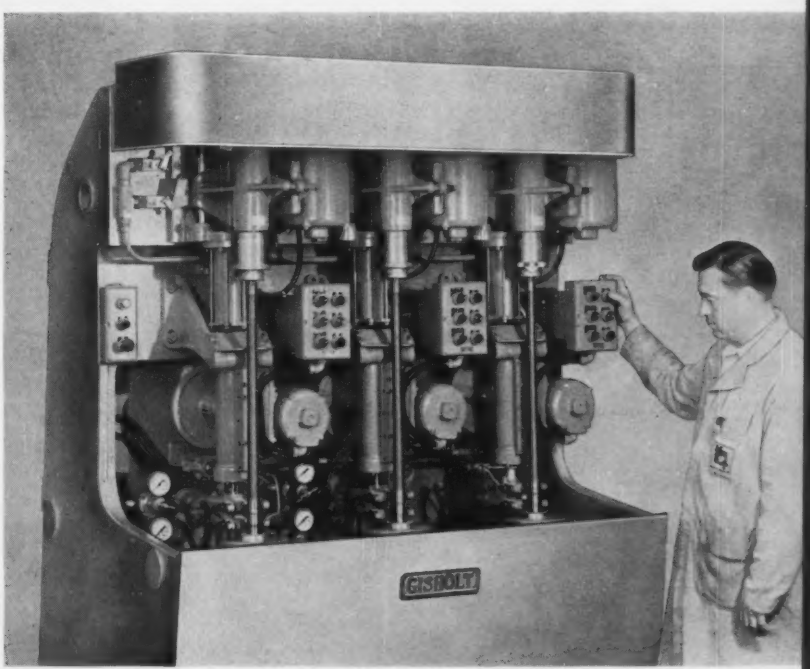


Fig. 3. Compact vertical arrangement of the work stations permits three rear-axle drive-shafts to be processed simultaneously.

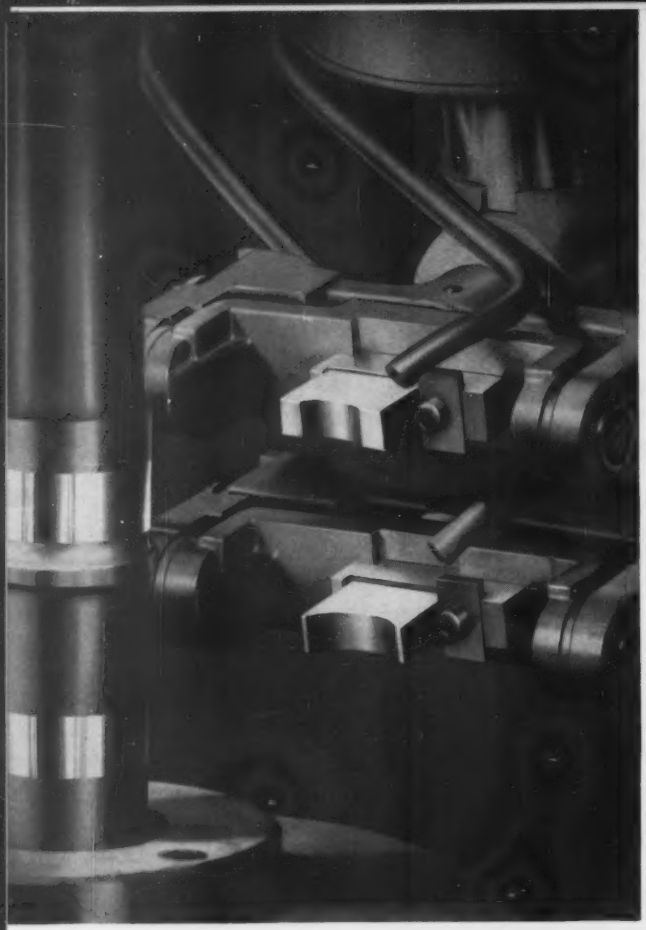
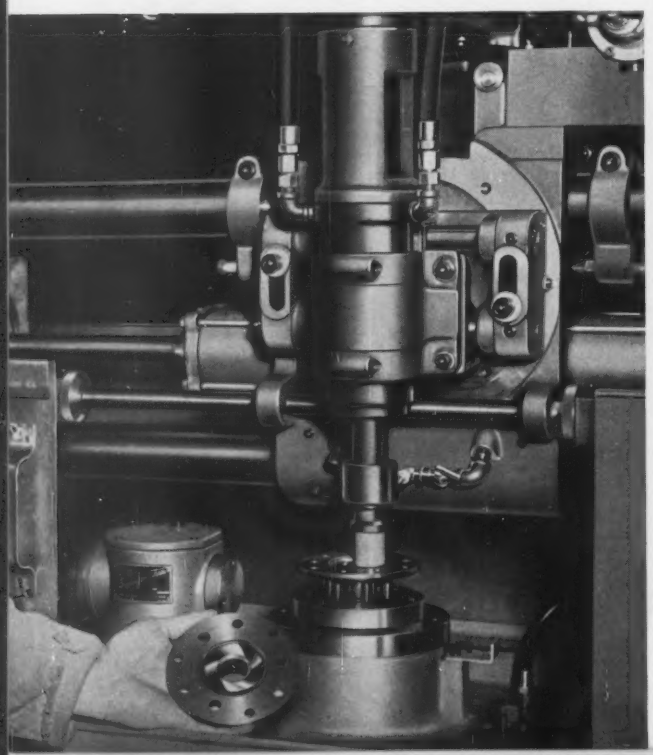


Fig. 4. When the quill pivots forward, the two stones are in contact with the respective oil-seal diameters of the shaft.



research in all aspects of the process goes on steadily. Some of the varied applications of Gisholt equipment are illustrated in this article.

A plunger for a hydraulic pump used to operate attachments for farm tractors is shown being Superfinished in Fig. 2. This is a view of a general-purpose machine. Three pairs of ball-bearing rollers support the work. One end of the plunger has a tongue which engages a driving adapter fitted on the spindle.

The Superfinishing head is supported by two bars above the machine spindle. A quill, the principal element of the head, has a stone-holder at its lower end. The stone used is a fine-grit bonded abrasive stick, initially dressed to correspond to the radius of the work. During the operation, a self-contained unit in the head advances the quill so that the stone is under light pressure. The head has a 3/16-inch oscillation and traverses along the bars as the work revolves.

As a preparatory step, the plunger was rough-ground to a finish of 20 to 30 micro-inches r.m.s. In the Superfinishing cycle, an 8 to 10 micro-inch finish is attained in about forty-five seconds.

The wear surfaces of innumerable car and truck parts currently are Superfinished. As might be expected in the automotive industry, high-production requirements make specialized machines practical. Two oil-seal diameters of rear-axle drive-shafts, for example, are handled on the equipment seen in Fig. 3. The shafts are held vertically, three being in work simultaneously at the three stations of the machine. Here, one operator turns out 350 to 400 axles per hour.

A close-up view of one of the stations of this machine appears in Fig. 4. The operator first places a part in the lower locating socket and presses a starting button, causing the driving head to descend and engage a spline on the upper end of the axle. A quill behind the axle, which contains two stone-holders in tandem, then pivots forward and oscillates up and down. After a predetermined time cycle, the quill retracts, the driving head brakes to a stop and rises, and the axle is partly ejected for unloading. Previously rough-ground to approximately 35 micro-inches, the parts are Superfinished to a surface measurement of 8 to 10 micro-inches in an actual stone contact time of only seventeen seconds.

Another special machine, seen in the heading illustration, Superfinishes the pins and main bearings of automotive crankshafts. In this instance, the part, while slowly revolving on its own

Fig. 5. In this application of the process, the stone is cup-shaped, and revolves rather than oscillates.

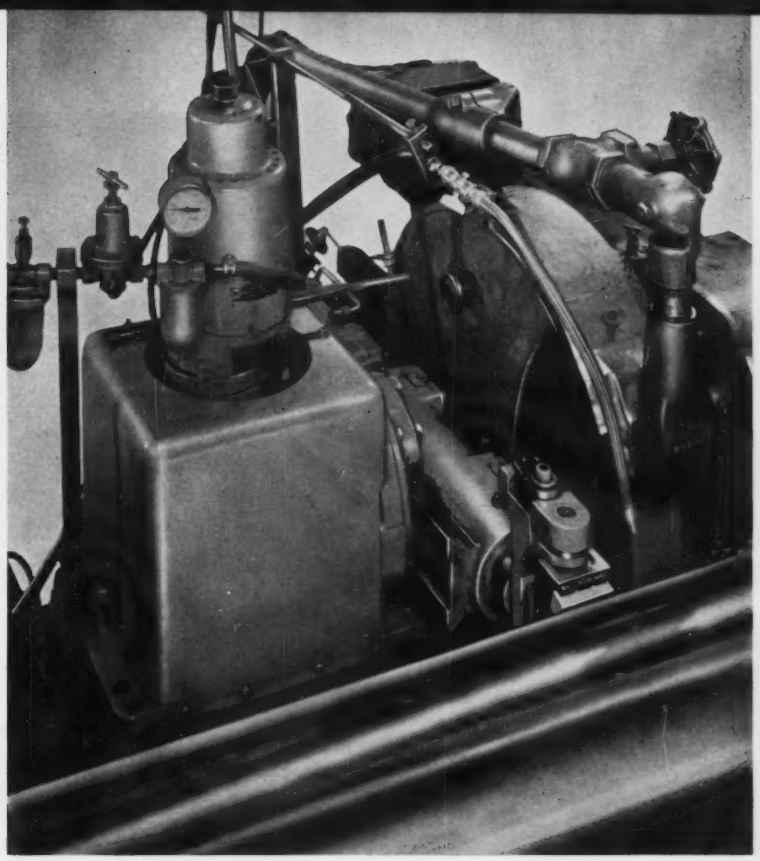


Fig. 6. A Superfinishing attachment mounted directly on the grinding machine is practical when the work is of large proportions.

centers, also oscillates laterally. Four quills clamp around the pin surfaces and follow the throws in their orbits. Then, five quills below the part swivel up and complete the main bearings. In the illustration, one of the stone-holders is being unclamped by pressing a button on the quill. Stone pressures are maintained hydraulically. In the operation, the surfaces are reduced from a finish of 16 to 26 micro-inches to that of 4 to 5. Complete cycle time takes seventy-five seconds.

Superfinishing brake-drum support plates, Fig. 5, illustrates the use of a rotary, rather than an oscillating, motion of the stone. The work is supported on a gear-driven platen which revolves during the cycle. At the same time, the Superfinishing head, containing a cup type stone, revolves and traverses across the work. The finish on the cast-iron plates is reduced from 50 to 80 micro-inches down to 7 micro-inches at a rate of sixty-five parts per hour.

In manufacturing machine tools, an application of the process to a large cylindrical surface is demonstrated in the finishing of the column for a Fosdick radial drill. To eliminate extra

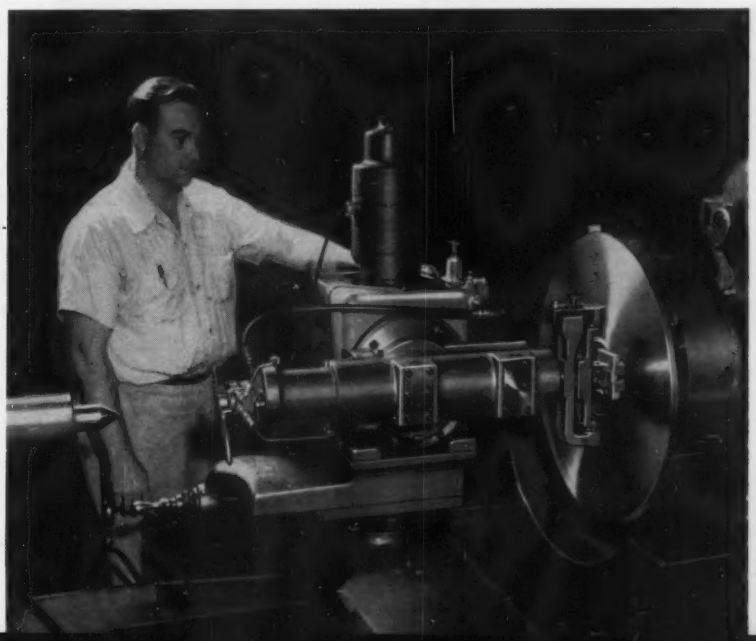


Fig. 7. The beam flange is Superfinished with an attachment mounted on the compound rest.

Fig. 8. The offset stone-holder provides a means of Superfinishing a large roller bearing outer race.

handling, a Superfinishing attachment is mounted directly on the grinding machine, Fig. 6. This particular column has a 12-inch diameter and is just under 38 inches in length. The column is first ground to 25 to 30 micro-inches, then Superfinished to 1 to 2 micro-inches.

Beam flanges for textile equipment are faced in an engine lathe, then Superfinished without an intermediate grinding step. In the set-up shown in Fig. 7, the attachment is mounted on the compound rest and is traversed across the flange by engaging the cross-feed of the machine. The faces of the stones are initially dressed flat.

Superfinishing is also used to eliminate the amorphous layer of smear metal on the inner and outer races of roller bearings. The outer race seen in Fig. 8 is reduced from a ground surface of 8 to 10 micro-inches to 1 to 2 micro-inches in a floor-to-floor time of sixty-six seconds. A spring-loaded offset stone-holder is used on a standard Superfinishing machine.

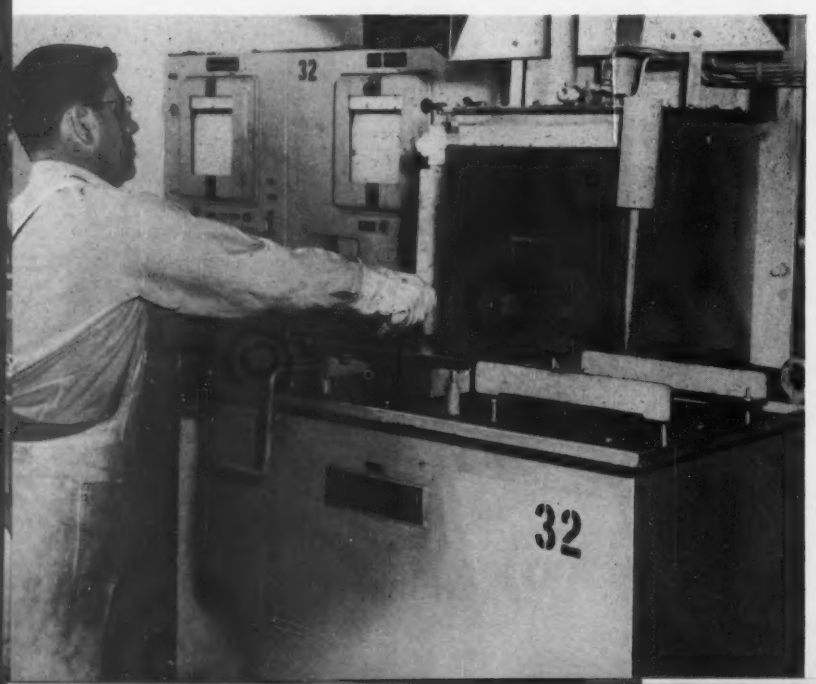
* * *

Furnace for Controlled Carburization

Difficulties involved in stamping small complex typewriter parts from high-carbon steel have been avoided at the Poughkeepsie, N. Y., plant of the International Business Machines Corporation. The same parts are now stamped from low-carbon steel and carburized in a Leeds & Northrup horizontal "Homocarb" furnace.

By means of "Microcarb" atmosphere control and L & N temperature control, the temperature and atmosphere may be held at optimum conditions throughout the heating and quenching cycles. A detecting element called a "Carbohm," which is part of the Microcarb atmosphere control, is located in the furnace work chamber.

This unit accurately measures and controls the carbon present in the furnace atmosphere. Through a carbon range of 0.15 to 1.15 per cent, the furnace can be controlled for hardening, carburizing, and carbon restoration.



Work-tray being placed in charging position in a Leeds & Northrup Homocarb furnace. The atmosphere in the work chamber is automatically controlled by a carbon-sensitive detecting device. Low-carbon steel parts may be accurately converted to high-carbon steel.

How Chrysler Carburizes and Quenches Gears

Six new radiant-tube furnaces with closely controlled atmospheres provide thirty lanes for the continuous heat-treating of parts. Special quenching equipment insures close control of quality with minimum distortion

By Herbert Chase

DIFFERENTIAL pinions and gears supplied in all automobiles and trucks produced by the Chrysler Corporation are now being gas carburized and quenched in modern equipment recently installed in the Lynch Road plant of the corporation in Detroit, Mich. Carburizing is performed in six new Surface Combustion radiant-tube continuous furnaces supplied with a closely controlled gas atmosphere. Then the gears are passed to banks of Gleason quenching presses for the hardening phase of the heat-treatment. A feature of one quenching process is the rotation of the pinions between centers.

Four of the furnaces (two for ring gears and two for pinions) have six lanes feeding through them, while the other two have three lanes. Trays of parts are advanced into the furnace vestibule manually, but continue their trip automatically. Each furnace is divided into four heating zones. An individual temperature control unit is provided in each of these zones.

Components are placed in special racks. Pinions, with their integral shafts, are held vertically in clusters of nine, as shown in the heading illustration. Ring gears are stacked with spacers between them on trays with vertical pins. Other style trays, designed to hold the parts in such a position as to assure a minimum amount of distortion and the production of the

Fig. 1. (Left) Rack of pinions, at a temperature of 1700 degrees F., emerging from one of the carburizing furnaces. Each part is transferred to another fixture in which it is immediately quenched before the temperature drops below 1500 degrees F.

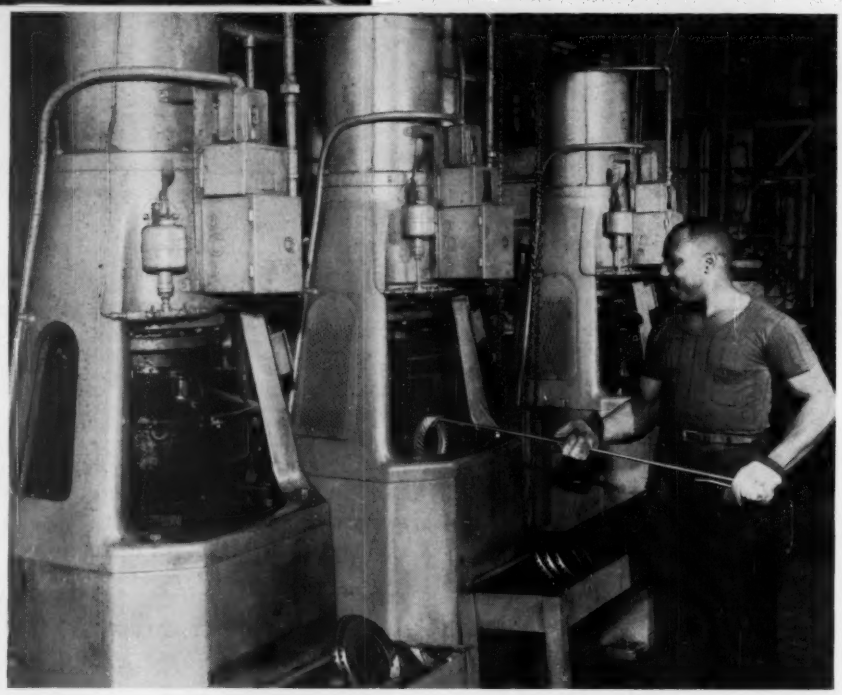


Fig. 2. (Right) Ring gears are clamped in these light presses and quenched in rapidly circulating oil. This is done within forty-five seconds after they are removed from carburizing furnace.

desired case depth, are also used. This depth usually ranges from 0.030 to 0.060 inch, depending upon individual part specifications.

The steel used for passenger car ring gears is S A E 4028, while that used for pinions may be either S A E 4028 or 8620. A case depth ranging from 0.040 to 0.050 inch with a minimum surface hardness of 58 Rockwell C is obtained on both components. Differential gears, however, have a case depth ranging from 0.030 to 0.040 inch.

Ring gears and pinions used in the company's line of trucks are made from S A E 8620 steel. Although the surface hardness required is the same as that for similar units on passenger cars —the minimum of 58 Rockwell C previously mentioned—the depth of penetration ranges from 0.050 to 0.060 inch. Truck differential gears are also made from S A E 8620 steel but have a case depth ranging from 0.040 to 0.050 inch. The rate of advancement of the parts in the furnaces is regulated to produce specified case depths.

Prepared atmosphere is supplied by a bank of four Surface Combustion RX generators, all of which lead into a common header feeding the six furnaces. Although either methane (natural gas) or propane can be used separately, a mixture in which methane predominates is currently employed, propane being held for stand-by use.

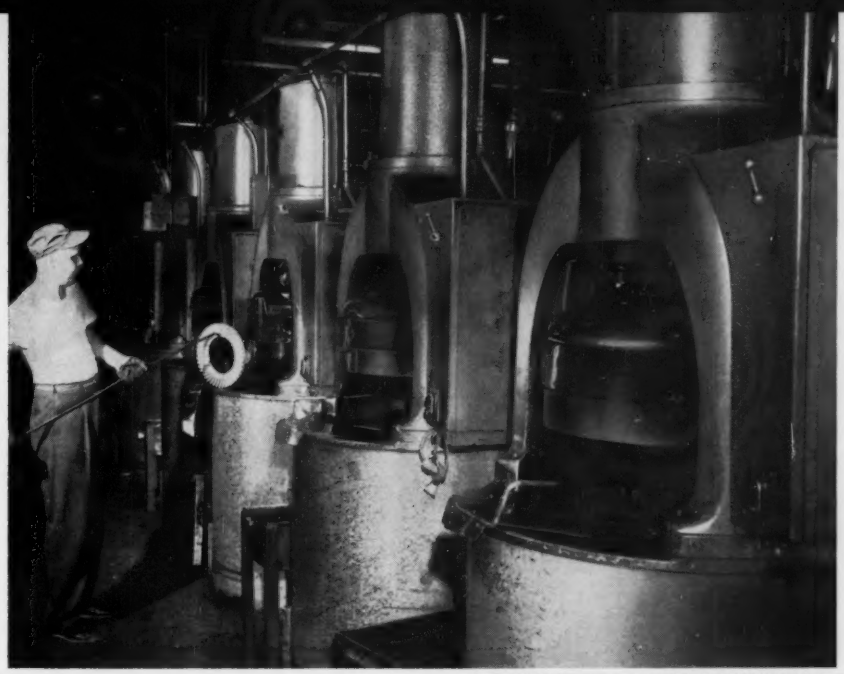


Fig. 3. (Left) Larger ring gears for Chrysler trucks and automobiles are oil-quenched in these heavier presses. The parts are securely clamped in order to avoid distortion.

Fig. 4. (Right) Three-spindle presses perform a combination straightening and quenching operation on drive pinions with integral shafts. While at a red heat, the pinions are straightened by rotating them against a roller.

The generators are normally operated at 75 per cent capacity at a temperature ranging from 1840 to 1850 degrees F. Beginning with two and one-half parts of air to one part of methane (seven and one-half to one for propane), the generator output is adjusted until analysis shows approximately zero percentage of both methane and carbon dioxide. Neither of these two constituents should be present in quantities exceeding 0.2 per cent. If methane has been used, a dew point falling between zero and 10 degrees F. is desirable; in the case of propane, a dew point ranging from 10 to 20 degrees F. is satisfactory.

A typical analysis of the gas produced by the generators when using methane shows the following breakdown:

CO_2	.....	0.1 per cent;
CO	.....	19.4 per cent;
CH_4	.....	0.0 per cent;
H_2	.....	39.6 per cent; and
N_2	.....	balance.

The dew point in this case is 8 degrees F. To this gas is added either methane or propane in amounts proportioned to the furnace load, after which it is fed to the first three heating zones.

In the third heating zone of the furnace, the amount of methane present in the atmosphere is held to within one and one-half to two and one-

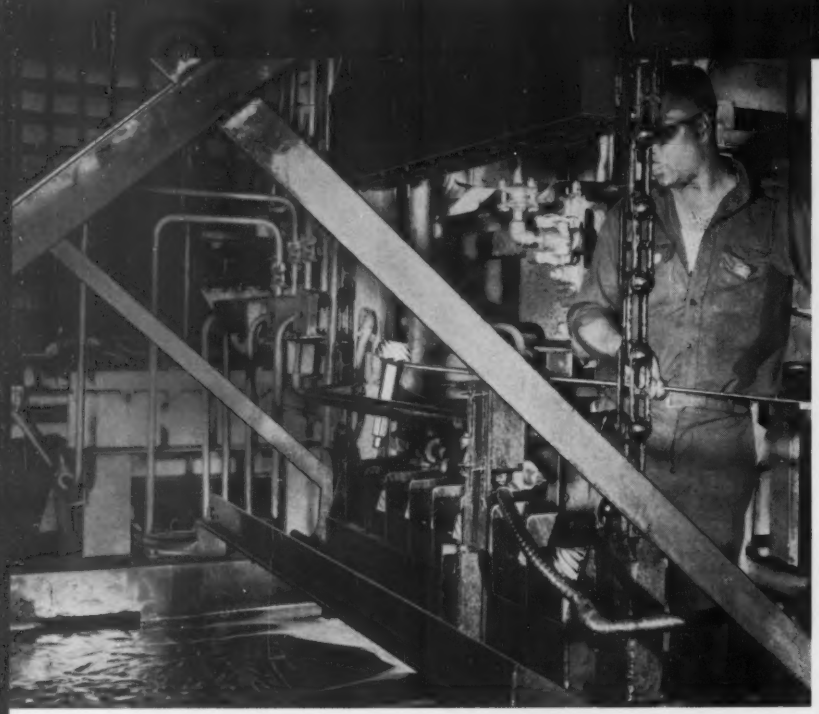


Fig. 5. Tank-quenching small drive pinions. The parts are placed in a rack that holds them vertically as they are lowered into, and advanced through, the rapidly circulating oil.

half times the amount calculated to be necessary for equilibrium. The carbon potential ranges from ten to twenty points higher than is specified at the surface of the work. To prevent outside atmosphere from entering the furnace in the event of a leak, and destroying the atmospheric balance within, a positive pressure of 0.1 to 0.2 inch of water is maintained on the prepared atmosphere. The average cycle time of the parts in the furnace is thirteen and one-half hours.

Racks of pinions emerge from the vestibule in one of the furnaces, Fig. 1. They are then advanced on roller conveyors to the point where they will be unloaded with tongs, one at a time, and set in quenching position. The time allowed for transfer is kept below forty-five seconds, during which the surface temperature drops from 1700 degrees F. to about 1500 degrees F.

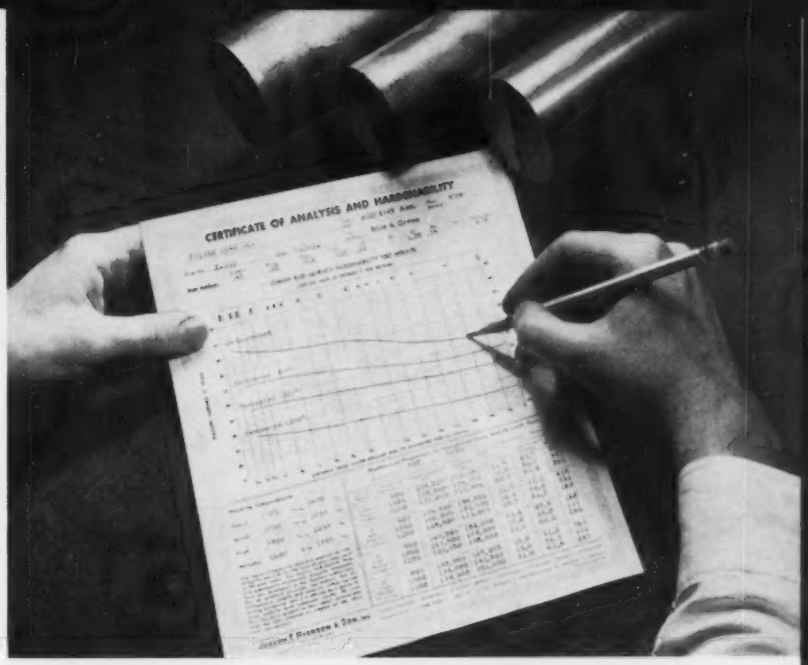
Quenching equipment includes twenty-eight small Gleason presses, some of which may be seen in Fig. 2, and six large Gleason presses, Fig. 3. They clamp the ring gear securely during quenching to avoid, or minimize, warping. Large pinions for Chrysler and DeSoto automobiles, and also for trucks, are quenched in three-spindle presses, Fig. 4.

In these three-spindle quenching presses, each pinion is placed in a vertical bracket that swings the work-piece into line with a pair of centers. The centers advance into contact with the pinion and rotate it against a roller to hot-straighten it in the event that distortion has occurred. The compartment door is closed and quenching oil is sprayed on the rotating part. Additional straightening prior to final machining is generally unnecessary.

A different procedure is followed for all other pinions. They are placed in individual cells within racks mounted on a vertical loop conveyor, Fig. 5. When the cells are filled, the rack is lowered into the quench tank. The quenching rate is controlled by the oil flow which is directed by pump outlets and baffles. They are placed so that each pinion receives equal and uniform quenching.

As the loaded rack descends into the bath, oil is directed upward against all sides of the pinions. The rack passes to the bottom of the tank, then moves horizontally to the opposite end where it is raised from the oil. Here the pinions

Fig. 6. Drive pinions are removed from the quenching fixtures and loaded into wire baskets. The baskets are moved out of the heat-treating section on conveyors for subsequent operations.



The user receives this certificate of analysis and hardenability with his shipment of steel. Certificate also contains color marking and heat symbol.

are unloaded by hand, placed in wire baskets, Fig. 6, and advanced on a roller conveyor to another section for blasting and final machining. The empty quench racks continue upward and around the overhead portion of the loop, and from there back for reloading.

All carburized parts, with the exception of ring gears and pinions, are mass-quenched. This method produces the desired results, and the tendency toward distortion is insignificant. In all cases, however, oil circulation is rapid and coolers are provided to maintain the oil temperature between 100 and 120 degrees F. Circulation of the oil is regulated so that the H-value, indicating the severity of the quench, ranges between 0.4 and 0.6.

Tempering of all ring gears, differential gears, and truck drive pinions is performed at temperatures ranging from 350 to 375 degrees F. The threaded ends of drive-pinion shafts are induction annealed after carburizing and quenching.

Following completion of the heat-treating operation, all gears undergo grit blasting. Ring gears and drive pinions are straightened if necessary, and various surfaces are ground. They are then matched and the teeth lapped and hard-rolled. This is followed by a Parco Lubrite treatment in which a phosphate coating is produced that absorbs and retains oil on bearing surfaces. Thus, rapid break-in of wearing surfaces is permitted and corrosion is retarded.

Production of all these transmission parts is accompanied by such inspection operations as are required to meet all specifications and quality standards. At least one gear from each heat is checked for case depth, and another is sent to Chrysler's central metallurgical laboratories for a separate check of case depth and hardness.

Alloy Steel Certification Assures Uniform Heat-Treating

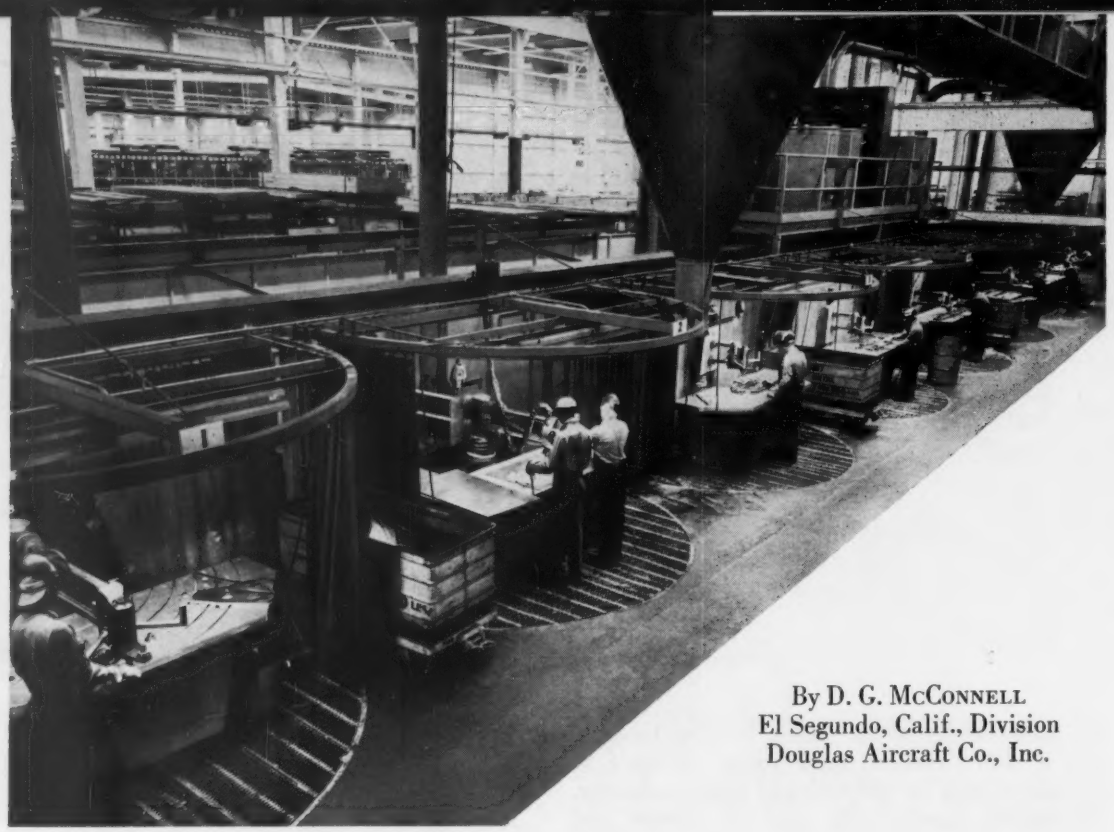
A belief that many users of alloy steels are more interested in their hardenability than in their chemical analysis has been confirmed in the success of a marketing program of Joseph T. Ryerson & Son, Inc. Specifying steels solely by chemical analysis—usually based on past experience—often has proved inadequate, because of the widely different results obtained in heat-treating material in which the percentages of the alloying elements varied even within the permissible ranges.

A feature of the program is a certificate of analysis and hardenability which accompanies every shipment of alloy steel bars. The certificate gives the user a complete analysis, identification, and test record of the steel, so that the guesswork is taken out of heat-treating. All alloy steels are spark tested as a double check for analysis variation from bar to bar. Each bar is marked with color to show its type. Larger bars are stamped and smaller bars are tagged with the heat symbol. Both the color marking and the symbol appear on the certificate.

Samples of each heat of alloy steel are subjected to a Jominy end-quench hardenability test. Medium-carbon alloy samples following quenching are tempered at 800, 1000, and 1200 degrees F. Hardness readings are taken, and the mechanical properties obtainable are plotted on the certificate for the benefit of the user.

* * *

The bombing system for a modern aircraft contains 259 miles of electrical wiring.



By D. G. McConnell
El Segundo, Calif., Division
Douglas Aircraft Co., Inc.

Router-Drills Speed Machining from the Solid

RADICAL changes in design of parts frequently must accompany other engineering modifications in order to attain the phenomenal speeds of jet aircraft. A significant illustration, one occasioned by the extreme pressures and vibrational stresses encountered, is the use of structural members and panels machined from solid sections of material in place of fabrications of spot-welded or riveted formed sheets. Described here is a combination radial arm router and turret drill. A battery of these combination machines perform a highly creditable job of machining from the solid high-tensile aluminum plate up to 1 inch thick.

The machine, shown in Fig. 1, is the product of three years of experiment and development in the plant engineering department of the Douglas Aircraft Division in El Segundo, Calif. Among the main elements are a work-table, a column, a high-speed electric-driven router, a five-station air-driven turret drill, a hydraulic power unit, and an alternator. The table is a heavy steel plate weldment with a thick plywood top. The column, centrally located at the rear of the table, is free to pivot, and also is moved vertically by the hydraulic power unit. Radial arms are contained in linear ball bearing races in the column, and are thus able to slide transversely. At their extremities they support the router and the drill.

Since work to be routed must be prepared with tooling holes (to accommodate hold-down screws) and usually also with rivet pilot holes, the router-drill combination is convenient for the worker. When preparing the holes, a drill template is placed over the work stack. As each tooling hole is drilled, a hexagonal head wood screw is inserted and driven into the table. When all tooling holes are completed, the turret is indexed and the rivet pilot holes are drilled, as in Fig. 2. Then, the screws are removed, a router block replaces the template, and longer screws are driven into the table. A pneumatic nut-runner, seen to the worker's right, speeds this operation.

All five turret stations are equipped with individual air motors. A pneumatic guide foot in front of each drill chuck serves not only as a bushing retainer but also as an additional means

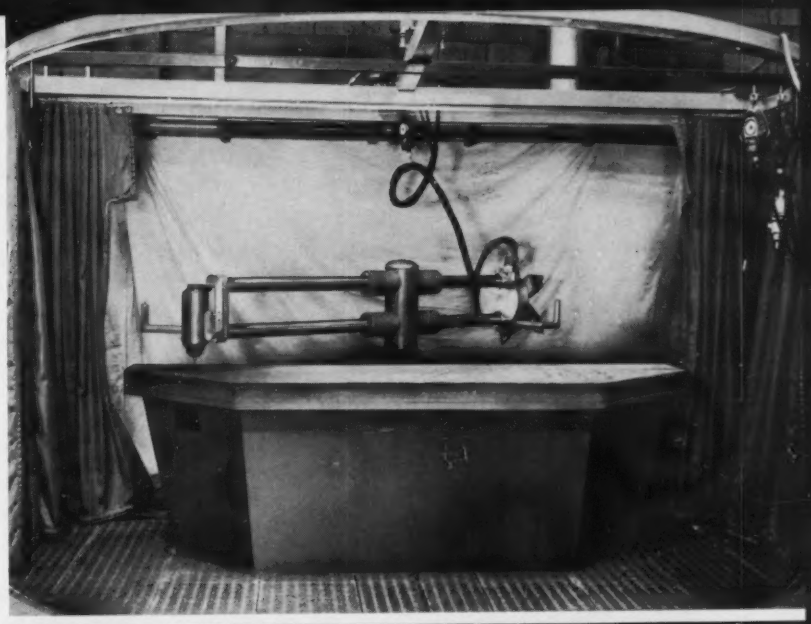


Fig. 1. The column pivots and the arms slide to position the electric-driven router and the air-driven turret drill at any point over the work-table.

Fig. 2. The feed movement of the drill is produced by the descent of the column. In front of each chuck is a pneumatic guide foot.

Fig. 3. The router is manually directed around the periphery of the router block by pivoting the column and sliding the arms.

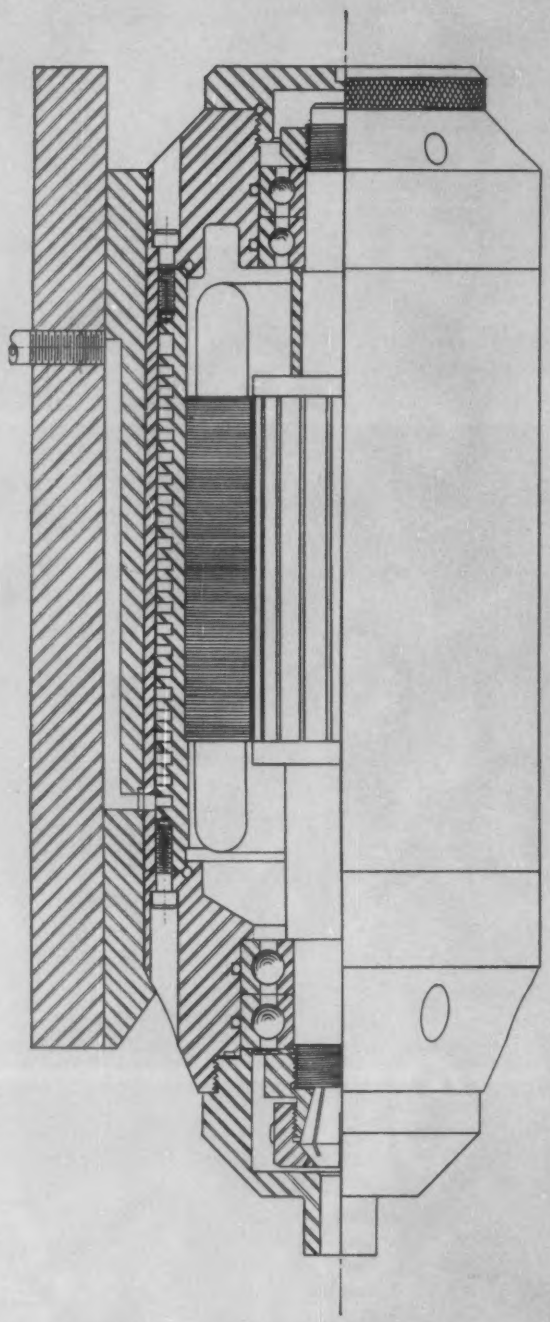


Fig. 4. In this cross-sectional drawing of the router motor, it can be seen how the cutting mist coolant is ingeniously employed to dissipate heat.

of holding down the work. To simplify maintenance, the motor housings and guide feet are independently replaceable. Four of the guide feet carry press-fitted bushings used for the more popular drill sizes. The fifth guide foot accommodates a slip-fitted bushing for a special size drill that may be required.

On each side of the turret are operating arms which locate it over the hole to be drilled. A button on one arm operates the hydraulic system in the table to lower or raise the column, thus supplying the means of advancing or retracting the drill. Another button, on the other arm, controls the air motors. As the drill descends, the guide foot retracts, maintaining a pressure of about 150 pounds on the template and work. If stacked sheets are being drilled, the pressure of the guide foot aids in excluding chips and reducing burrs.

The hydraulic system is also employed to lower or raise the router. In this way, gibs and ways for vertical adjustment at the motor mount are eliminated, and there is no necessary looseness to pick up harmonic vibration from the high-cycle motor.

A router operation is seen in progress in Fig. 3. Movement of the router to follow the periphery of the router block is controlled through two diagonal operating arms. A toggle switch on one arm operates the hydraulic system (like its counterpart on the turret), and a switch on the other arm controls the router motor. Depth of the cut is infinitely variable in a 6-inch range, and controlled to within 0.002 inch over distances as long as 10 feet. Retractions can be set from 1/4 to 6 inches.

In Fig. 4 a drawing is shown of the router motor. It operates on 360 cycles at 220 volts, which gives it a speed of 21,500 R.P.M. Current is provided by a 10-K.V.A. motor alternator which has automatic voltage regulation. The use of a 7 1/2-H.P. motor within the physical dimensions normally occupied by 3-H.P. motors in the high-cycle field is made possible by a unique dual cooling arrangement. The oil mist used as the cutting coolant is circulated through a spiral groove in the outer case before being ejected onto the cutter, thus carrying away the heat generated in the back iron. Another oil mist stream is directed through the upper bearings of the motor, down an air gap, and then out through the lower bearings, thus dissipating the heat from within the motor itself.

Failure of the lower bearing has been cut by having the mist stream (at a pressure of 100 pounds per square inch) continuously in operation when the alternator is running, so that there is little likelihood of blowing chips into the bearings while cleaning the router collet during cutter changes. Dynamic braking is provided to

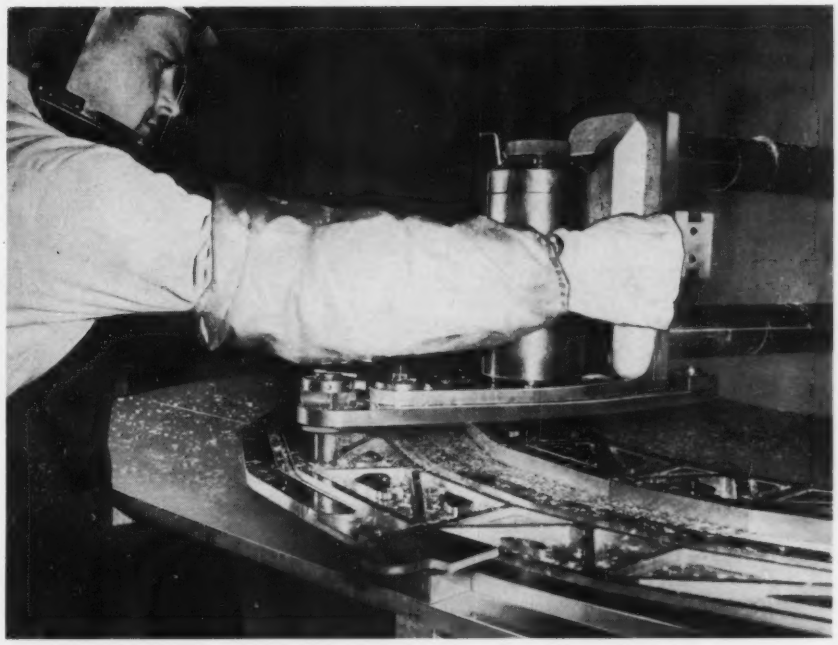


Fig. 5. For this pantograph operation, the template and work are supported in a predetermined position over a steel plate.

stop the motor in four to ten seconds. An automatic timer delays the initial start of the motor until tubes in the control circuit heat up.

Chips fall through a semicircular grating in the floor in front of the machine to a conical pit. From there, they are sucked through ducts to a cyclone separator which removes the chips through a hopper, and exhausts the fumes generated by the cutting coolant.

The work area around each machine is enclosed with a Lumite curtain. Made of heavy gage, the curtain stands up well against the bullet speed of the chips. At the same time, it affords limited vision so that supervisors can observe work being performed. Curtains are hung on drapery type tracks so that they can be adjusted to accommodate long work-pieces which must extend from the booths.

In addition to regular production runs in the Douglas plants at El Segundo and Torrance, Calif., the new equipment is in constant use for product research. Developments have shown a wide variety of milling possibilities that will speed production without sacrificing precision.

Pantograph duplicating, for example, is showing considerable promise. Here, the template is located in position on a steel plate which is fastened to the plywood table top. Concentric T-slots in the plate, visible in the heading illustration, provide the means for holding the template in proper predetermined relationship with the work. In Fig. 5 is a close-up view of a pantograph operation. The router is equipped with an extension bar which has a follower roller in its end.

Simple Economics for Lubricant Buyer

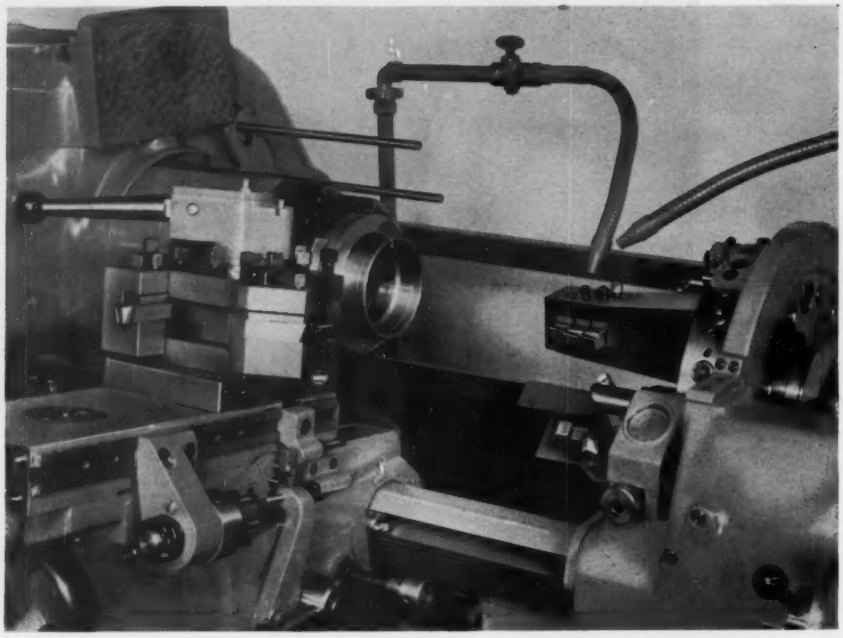
By R. L. WATTS, Manager
Lubriplate Division, Fiske Bros. Refining Co.
Newark, N. J.

Today's lubricant is a versatile product. Its primary function of reducing friction and giving protection against corrosion must be performed over a wide range of loads and speeds, and often under such unfavorable operating conditions as extreme temperatures, moisture, steam, acids, or contaminants. While there is a definite trend toward selecting lubricants strictly on a performance basis, many buyers are still enticed by a low initial cost.

Actually, the initial cost of a lubricant is but one of several expenses involved. The true cost of lubrication must be estimated by power losses because of friction, maintenance costs and parts replacements because of wear, production losses occasioned by machine failures traced to faulty lubrication practice, and other factors. Lubricant suitability—not its initial cost—must be thoroughly investigated and should be the deciding factor in choosing the product.

* * *

Delicate assembly is required to produce an almost completely stress-free hair spring at the Elgin National Watch Co. A special alloy used in the spring is one-fifth the thickness of an average human hair. The inner end is cemented to a positioned spool around which it is coiled.



Drum Type Turret Lathes Tooled Up for Production

SMALL and medium-sized turret lathes distinguished by a turret mounted on a horizontal axis are employed extensively in European metal-working shops. The turret indexes in the same plane as the work-spindle to bring a multiple number of tools successively into line with the work. Machines of this classification, known as "Pittler drum type turret lathes," are marketed in this country by the Cosa Corporation, New York City.

One of these machines, set up for a contour-turning job, is illustrated in Fig. 1. A template *A* is mounted on the inner portion of the lathe bed. As tapered follower-screw *B* moves along in contact with the template, tool bit *C* generates the desired shape on work-piece *D*.

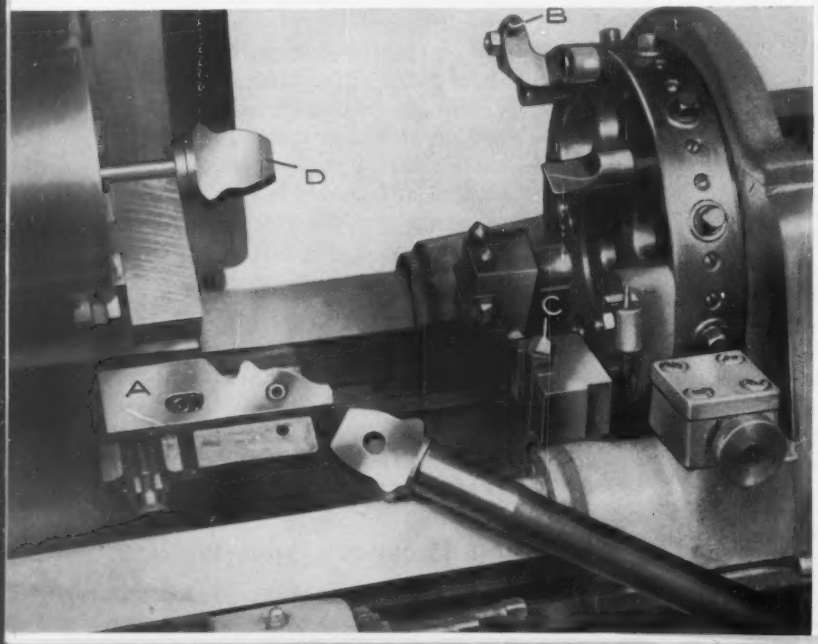


Fig. 1. Contour-turning on a drum type turret lathe. Follower-screw (B), mounted on the drum, is held in contact with template (A), causing the tool bit to trace the template profile in work-piece.

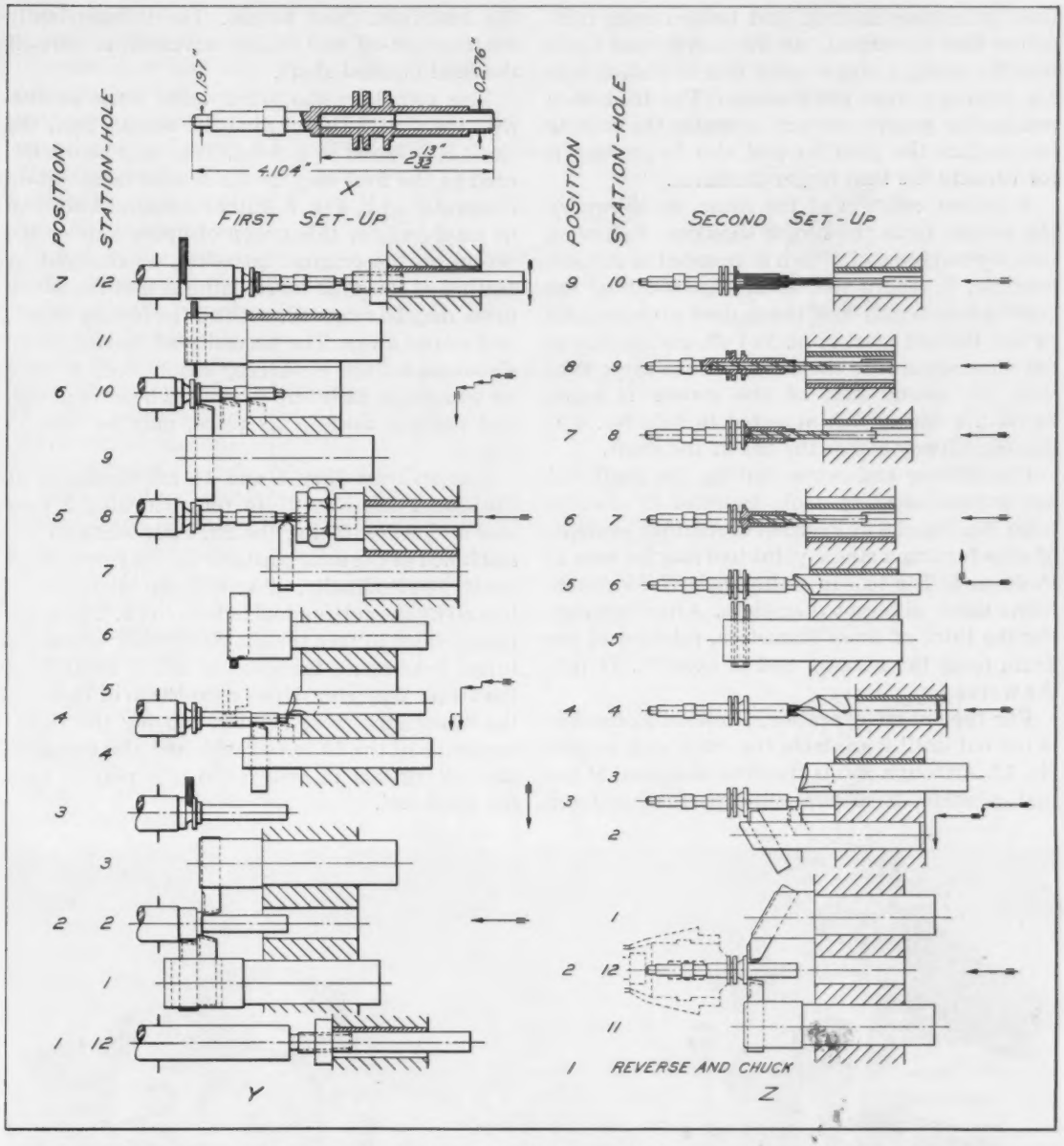


Fig. 2. Complex shaft is machined from steel bar stock in two set-ups. All tooling, except the cut-off tool, is located in the drum, thereby eliminating the need of a cross-slide.

A small shaft shown at X in Fig. 2 is designed for use in automatic calculating machines and teletype machines. It is hollow for the major part of its length, and is made from 7/8-inch diameter ball-bearing steel bar stock. The shaft is machined by means of the tooling lay-outs illustrated at Y and Z. It is interesting to note that none of the cutting operations require the use of a cross-slide.

At the initial position (Y, Fig. 2), a stock stop, mounted in station-hole No. 12 of a twelve-hole drum, is lined up with the lathe spindle and the bar stock fed out to it. Although holes Nos. 1, 2, and 3 are utilized at the second machining position, hole No. 2 merely provides clearance for the end of the work-piece. A multiple-point cutting tool in hole No. 1 and a single-point cutting tool in hole No. 3 form three diameters simultaneously as the turret-head is fed toward the headstock. A separately mounted cut-off tool is fed into the work, Position 3, to rough-form one groove.

The operation performed at the fourth position is slightly more involved than the first three. Movement of the turret-head is shown by arrows at the right-hand side of each position—solid

lines indicating cutting, and broken lines indicating free movement. As the turret-head feeds into the work, a single-point tool in station-hole No. 4 turns a small end diameter. The drum then rotates the proper amount to enable the cutting tool to face the shoulder and also to position it for turning the next larger diameter.

A second rotation of the drum, as shown by the arrow, faces the larger shoulder. Following this, a grooving tool, which is mounted in station-hole No. 6, enters the work. The width of the cutting tool is only half the desired groove width so that the tool must be backed off, advanced, and fed once again into the work. At the same time that the second half of the groove is being formed, a facing tool mounted in hole No. 5 is passed halfway across the end of the shaft.

Chamfering and center-drilling the shaft end are accomplished by tools mounted in station-holes No. 7 and 8 at Position 5. Another example of step-feeding a single-point tool may be seen at Position 6. The tool in station-hole No. 9 finish-turns three different diameters. After completing the third of these diameters, rotation of the drum feeds the necking tool in hole No. 11 into the work.

For the cut-off operation, Position 7, the bar is fed out until it contacts the stock stop in hole No. 12. Although this is the same stop used at the first position, it is now situated further from the headstock than before. The independently mounted cut-off tool is then advanced to part-off the semi-finished shaft.

This completes the turret lathe work on one-half the shaft. To machine the second half, the shaft is inserted in a collet. This may be considered as the first step of the second lathe set-up illustrated at Z, Fig. 2. Either a second lathe can be employed for this group of operations or the set-up on the original lathe can be changed. A feature of this type turret lathe is that the entire drum may be removed, with all the tooling intact, and stored away. The necessity of tearing down elaborate set-ups is thereby eliminated. A lathe on which one tooled-up drum has been removed, and another used in its place, may be seen in Fig. 3.

Station-holes Nos. 1 and 11 are employed at Position 2 (Z, Fig. 2) in rough-turning a long step and rough-facing the fin. Four surfaces are machined at the next position. As the turret-head feeds longitudinally, a small step diameter is turned by the cutting tool in hole No. 2. The drum then rotates to face the shoulder, after which the turret-head again feeds to the left to finish-turn the larger diameter. Upon completion of this cut, the drum once more rotates, causing the right-hand side of the fin to be faced, and also bringing the cutting tool in hole No. 3 into play to face the shaft end.

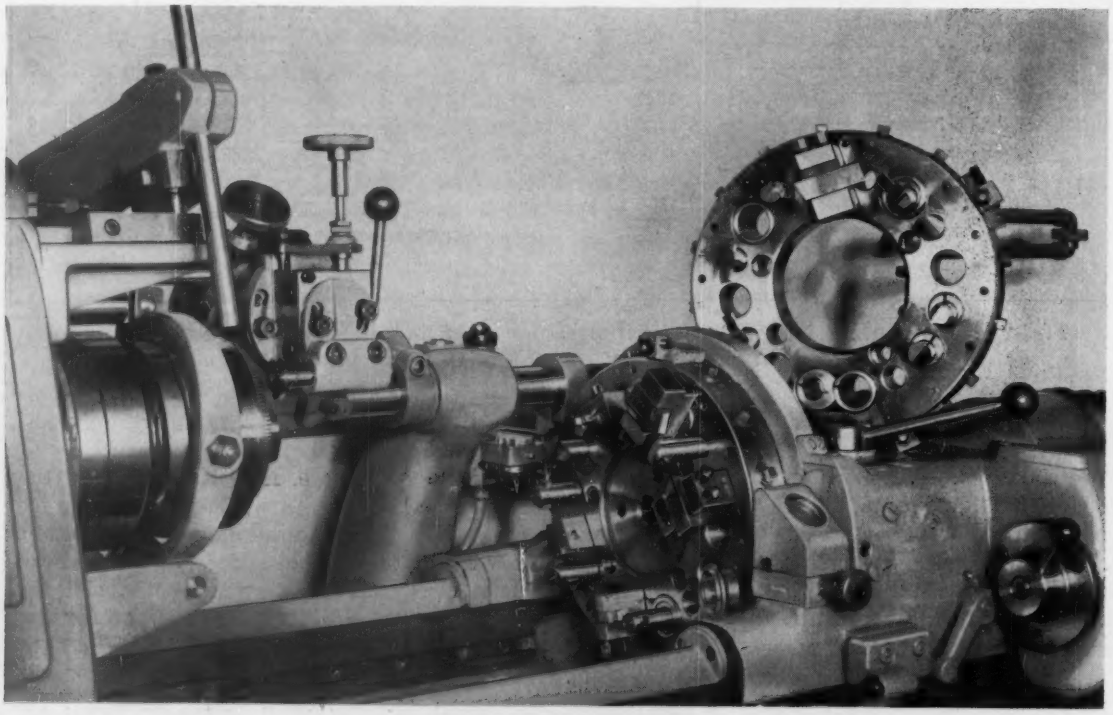


Fig. 3. Drums may be removed with all tooling intact and stored away. A new drum is then installed for the next job. As a result, much set-up time is saved on repeat runs.

At Position 4, a large countersink enters the shaft end in preparation for several more drilling operations to follow. Straight-feeding of a tool held in station-hole No. 6 chamfers the end of the work-piece. Subsequent rotation of the drum allows the tool in hole No. 5 to take these plunge-forming cuts, thereby completing the external machining of the part.

Four drilling operations are all that remain to complete the turret lathe work on the shaft. The first of these may be seen at Position 6. Here, a drill is fed into the end of the shaft, leaving an under-size hole. At the next position, a second drill enlarges the hole, leaving a sufficient amount of metal for reaming.

A hole of smaller diameter than the first is drilled to a depth of 2 13/32 inches at Position 8. Final sizing of the larger hole is accomplished by a reamer mounted in station-hole No. 10 at Position 9. The total floor-to-floor time required for machining both halves of the shaft is eleven minutes.

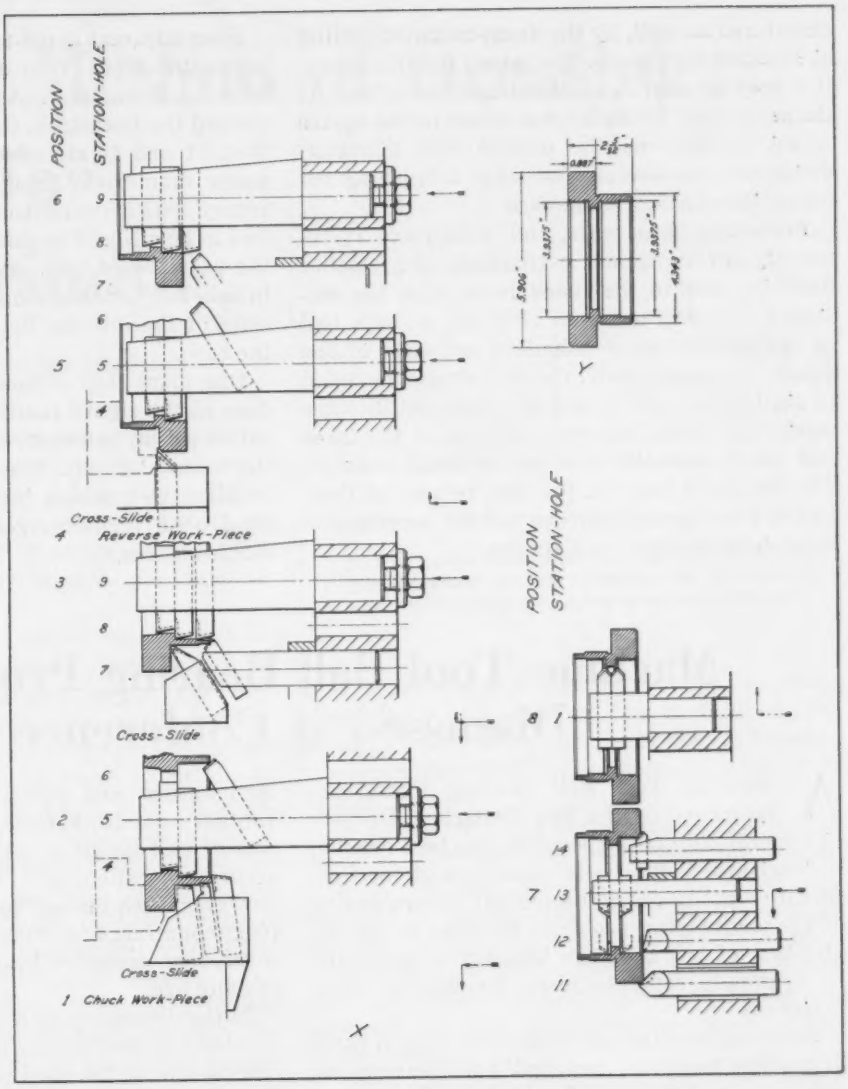


Fig. 4. Forged-steel bearing sleeve is machined in a single set-up through the combined application of the turret-head and cross-slide. A good example of multiple tooling in a single operation is shown at Position 2.

A typical tooling lay-out for chuck work in which a cross-slide is brought into play may be seen at X in Fig. 4. Here, a forged-steel bearing sleeve (shown at Y), which is intended for use in a tractor, is being machined. In the first phase of the machining cycle, the forging is gripped on its flange in a three-jaw chuck. Two steps have been cut in the chuck jaws—the larger diameter step for gripping the forging flange during the first three operations, and the smaller diameter step for gripping the hub during the remaining operations.

A total of seven individual cuts are made at Position 2: three by the tooling mounted in the drum, and four by the tooling mounted in the square turret on the cross-slide. A longitudinal feed movement of the turret-head rough-bores the inside diameter and the internal flange, and chamfers the mouth of the forging. The three tools used are clustered on a single tool-holder in station-hole No. 5. A similar movement of the cross-slide succeeds in turning two outside hub diameters, following which the slide is backed off, the result being that the flange and forging end are faced.

Finishing cuts are taken across the two inside diameters and the internal flange, and the hub is

chamfered as well, by the drum-mounted tooling at Position 3 (Fig. 4). The set-up for this operation may be seen in the heading illustration. At the same time, a single form cutter in the square turret finish-turns the outside hub diameter, under-cuts the corner, and takes a finishing cut across the exposed flange face.

Following these cuts, the work-piece is removed, reversed, and rechucked; the smaller diameter step in the chuck jaws grips the machined hub. At Position 5 (Fig. 4), a single tool in the square turret chamfers one edge of the flange. Simultaneously, the tool cluster mounted in station-hole No. 5 is once again fed into the work. This time, however, only one of the three tool bits is actually involved in metal removal. The tooling in hole No. 9 is also re-used at Position 6. Here again, only one tool bit is cutting to finish-bore the bearing diameter.

Four adjacent drum-mounted tools are used in a two-directional feed movement of the turret-head at Position 7. As the turret-head feeds toward the headstock, the tools mounted in holes Nos. 11 and 14 chamfer the inside and outside flange diameters. These cuts are followed by a rotary feed movement of the drum, causing the tool in hole No. 12 to take a facing cut across the the rear flange face. Also, a twin-cutter set-up in hole No. 13 takes a finish-forming cut on both sides of the internal flange and under-cuts it at the base.

One more step completes the job, that being done at the eighth position. Here, another twin-cutter set-up is employed to break the edges of the internal flange. The total floor-to-floor time required to machine this forging to the extent illustrated, including rechucking at Position 4, is 9.3 minutes.

Machine Tool Ball Bearing Problems Discussed at Conference

A Machine Tool Ball Bearing Conference sponsored by the New Departure Division of General Motors Corporation was held recently in Hartford, Conn. Basic objectives of the Conference were to develop a mutual understanding of the engineering problems involved in the application of ball bearings in machine tools, and to formulate concrete ideas for solving these problems.

Basic engineering topics covered in open panel discussion meetings included ball bearing requirements of the machine tools of the future; problems and experiences with shaft and housing fits; pre-loading and effect on bearing performance; bearing lubricants and their choice; design, limitations, and performance of bearing closures; and factors affecting spindle bearing life and operation.

Continuous research and testing is being carried on at the New Departure Division so that machine tools of the future can operate at higher speeds; produce closer tolerances and better finishes; handle new, tougher alloys; and result in less down time. Improved manufacturing, heat-treatment and inspection techniques for the production of bearings have done much to increase their fatigue life, reduce failures, and permit increased loading.

The importance of proper fit between the bearing and the shaft and housing was stressed to maintain rigidity, develop calculated pre-load, reduce vibration, realize average life, control temperature, and prevent excessive creep. Advantages resulting from the use of pre-loaded sets of ball bearings include more positive and accurate location, and less spindle vibration. However, such installations require a more complex mounting, and must be properly controlled to prevent excessive heat generation and short bearing life.

In the discussion on bearing lubricants, it was pointed out that sulphurized cutting oils are not detrimental to the steel parts of bearings. However, such oils may cause trouble when brass or bronze retainers are used in the bearings. In general, oil is more effective and preferred to grease as a ball bearing lubricant, especially for high-speeds and high-operating temperatures. Grease lubrication may be less costly, reduce contamination, and permit longer periods of operation without maintenance.

It was predicted that integrally sealed bearings capable of high-speed, heavy overload operation at temperatures from −100 to +500 degrees F. will be available as soon as lubricant problems are solved. The importance of maintaining extreme cleanliness in order to improve spindle bearing operation and extend bearing life was emphasized.

The Conference included a trip to the Research Department and Engineering Laboratory of the New Departure plant in Bristol, Conn. Manufacturing areas where precision bearings for the machine tool industry are made were also visited.

Tangent Method of Dressing Wheels for Form-Grinding

By James Watt, Royal Oak, Mich.

IT is possible to form three angles to size on a grinding wheel by employing a tangent type wheel dresser in conjunction with a simple formula. Since three-angle forms are so commonly used, application of this method will speed up form surface grinding in the majority of cases.

Some of the various shapes encountered in grinding form cutter tools are shown in Fig. 1. These shapes can be dressed on the grinding wheel so that the complete form can be ground on a part in one operation. This eliminates the time-consuming practice in which a portion of a form is dressed on the wheel and the work ground to that shape, after which the wheel is ground to a second shape for grinding a continuation of the contour on the work. Of course, the two portions of the contour must be correctly blended. This practice is ordinarily repeated until the complete contour has been finished.

The tangent method of dressing grinding wheels under consideration here involves the application of a combination angle and radius dresser, Fig. 2, which is manufactured by the Last Word Sales & Engineering Co., Detroit, Mich. With this dresser, the surface of the grinding wheel being formed is always tangent to a circle described by the diamond when it is rotated.

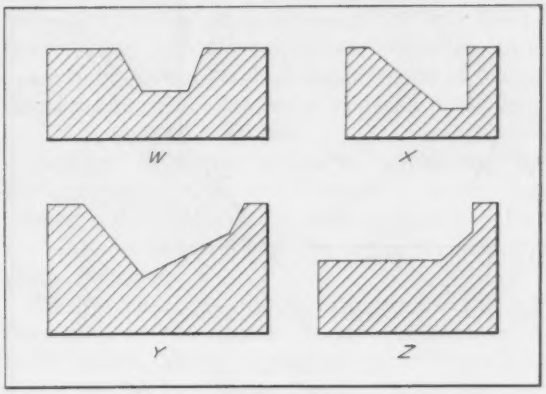


Fig. 1. Typical forms which can be dressed in a grinding wheel precisely to size by use of a tangent wheel dresser and a few simple calculations

To set the diamond to the desired radius, the diamond point is moved away from the axis of dresser rotation. The direction in which the diamond is moved with respect to the axis of the dresser determines whether a convex or a concave surface will be formed. Dressing of the grinding wheel is accomplished by rotating the large knurled knob located at the right-hand end of the device.

A vernier scale is provided to aid in angle

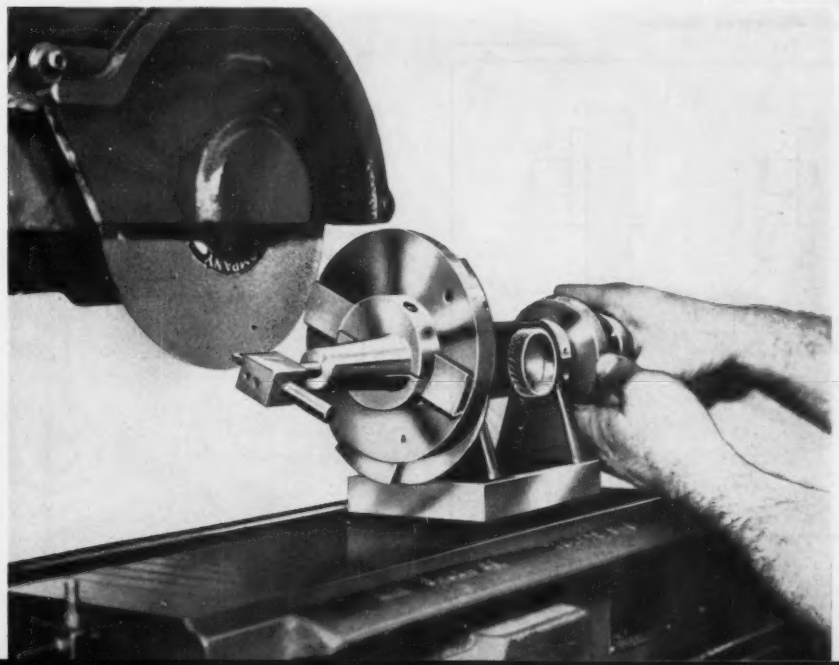


Fig. 2. A tangent wheel dresser mounted on a magnetic chuck. Rotating the large knurled knob at the right permits radius dressing of the wheel.

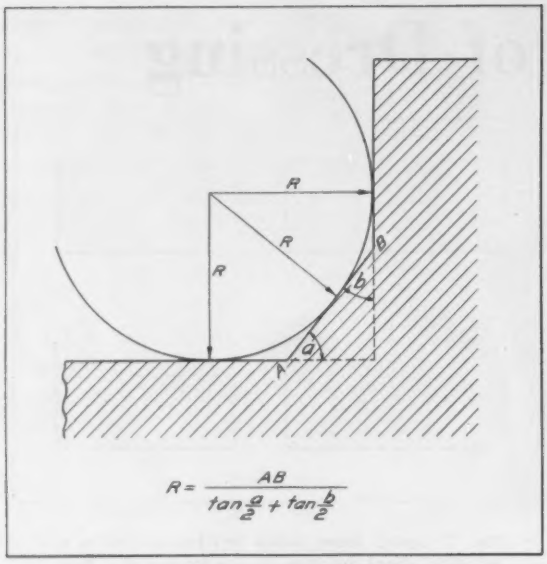


Fig. 3. Basic formula for finding a radius that is tangent to all three faces of desired form

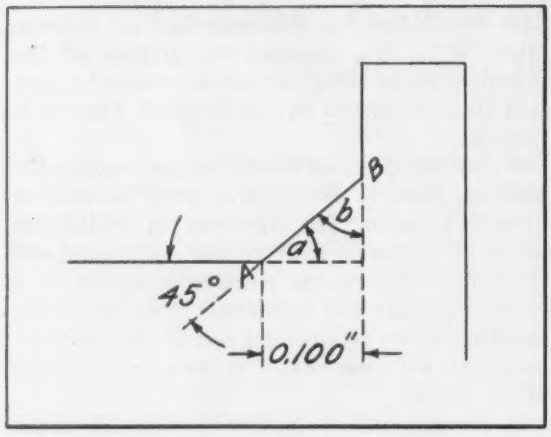


Fig. 4. Typical case requiring the calculation of the radius setting for the dresser in order to obtain this right-angle step with a 45-degree chamfer

dressing. To dress an angular surface, the vernier is set to the angle desired and locked. By rotating the smaller knurled knob, the diamond dressing tool will be moved along a dovetailed slide at the proper angle. An important point to remember is that the angle is always tangent to the radius to which the diamond point is adjusted.

The commonest shape and the simplest one to handle, is shown at Z in Fig. 1. It is composed of a 90-degree step with a 45-degree corner chamfer. If the diamond is set to dress a convex surface whose theoretical circle is tangent to these three planes, they can be dressed to size on the wheel.

A basic formula for determining the necessary radius is

$$R = \frac{AB}{\tan\frac{a}{2} + \tan\frac{b}{2}}$$

Letter designations are shown in Fig. 3. The derivation of this formula was given in October, 1953, MACHINERY, page 209, in an article written by Ronald L. Wakelee. Note that the tangent of one-half the angle is required, not one-half the tangent of the angle.

In the case illustrated in Fig. 4, which may be taken as an example, the 45-degree angle and the 0.100-inch dimension are given. All that remains to be found is the length of chamfer *AB*. The value of this hypotenuse may be arrived at by the use of simple trigonometry, as follows:

$$\text{sec } 45 \text{ degrees} = \frac{AB}{0.100}$$

$$AB = \text{sec } 45 \text{ degrees} \times 0.100$$

$$= 1.4142 \times 0.100$$

$$= 0.14142 \text{ inch}$$

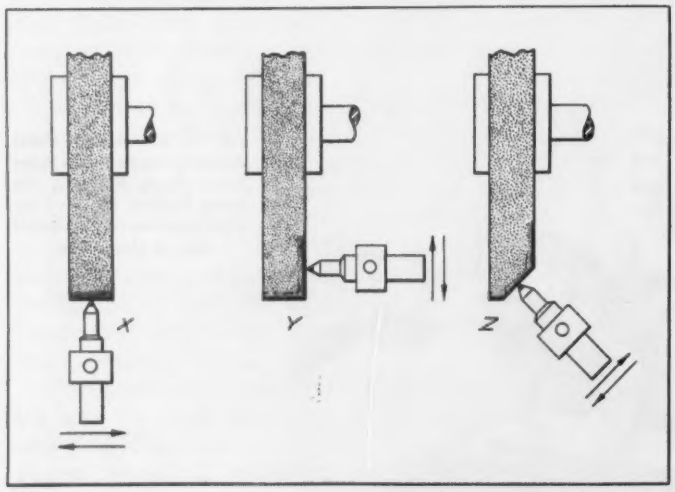


Fig. 5. Dressing of the grinding wheel is accomplished in three steps, one for each surface of the form. All three passes of the diamond dressing tool are tangent to the calculated radius.

The final step is to substitute the value of AB into the formula

$$R = \frac{AB}{\tan\frac{a}{2} + \tan\frac{b}{2}}$$

Hence:

$$R = \frac{0.14142}{\tan 22\ 1/2 \text{ degrees} + \tan 22\ 1/2 \text{ degrees}}$$

$$= \frac{0.14142}{0.41421 + 0.41421}$$

$$= \frac{0.14142}{0.82842}$$

$$= 0.17071 \text{ inch}$$

The radius that will be tangent to all three sides of the configuration is thus found to be 0.17071 inch.

To dress the form on the grinding wheel, the dresser should be adjusted to form a convex radius of 0.1707 inch. It is a good idea to roughly stone the approximate form on the wheel by hand in order to avoid burning the diamond in taking heavy cuts. With the dressing unit mounted on the grinding machine and with the vernier set at zero degrees, the bottom face of the wheel is dressed as shown at X in Fig. 5.

Following this, the vernier is set to a reading of 90 degrees and the cross-slide of the grinding machine is moved until the diamond contacts the side of the grinding wheel. This portion of the wheel is now dressed as shown at Y, Fig. 5. Without moving the dresser, the vernier is set to a reading of 45 degrees and the diamond is fed to dress the angle. A chamfer of precisely 0.100 inch will be dressed on the wheel.

Accuracy with this method is limited only by the care with which the diamond is set to the proper radius. It must be remembered that diamonds do wear and it is necessary to periodically check the radius.

The formula used in the example for finding the radius may be applied to any combination of three planes, and is therefore the only one actually needed. In order to simplify this procedure for various applications, however, additional formulas have been derived and are illustrated in Fig. 6. They will cover practically any situation.

Study of the formulas together with a little practice will reduce much of form-grinding to a routine process. A skillful operator will find that there is much less strain and effort involved, and that grinding and checking time have dropped a considerable amount.

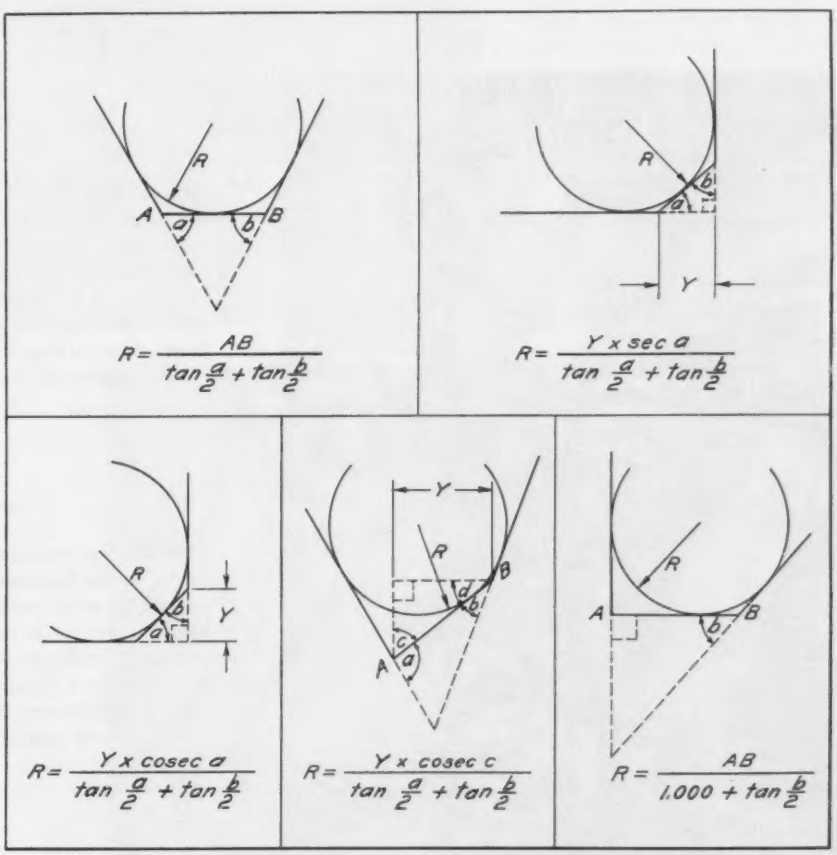


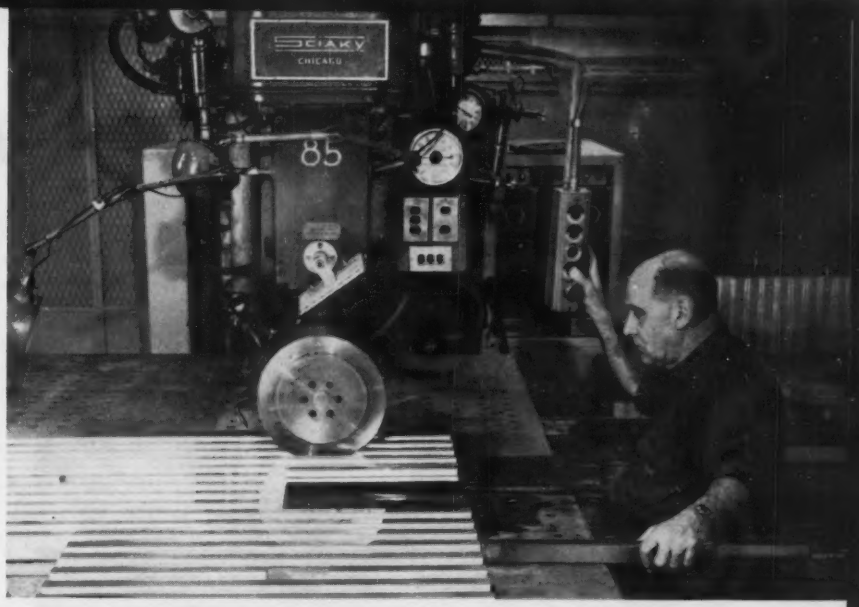
Fig. 6. Variations of the basic formula are intended to simplify its application to other forms of three-sided contours.

Cross-Section of Boeing Aircraft Production

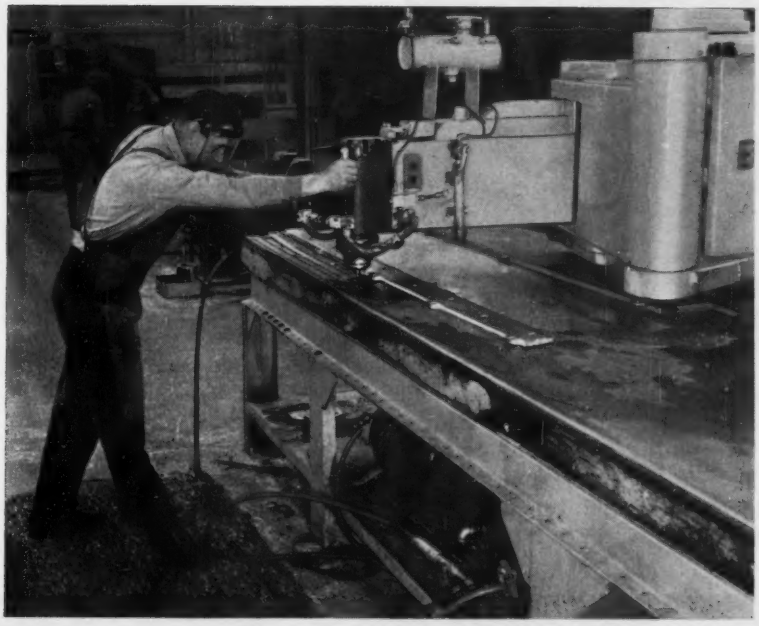
Machines of ever larger capacities, together with those designed to perform special jobs, are the backbone of today's aircraft production. Several such machines are shown here in a brief pictorial trip through the Seattle, Wash., plant of the Boeing Airplane Co.

(Above) The largest hydraulic press installation in the plant is this 7000-ton HPM unit. Pressure is applied to the work through rubber pads. These pads flex around the blank and tend to distribute the working load in many directions, thus forcing the work around the contour of the forming die.

(Left) A large steel bar is supported by a center in the hexagon turret of the company's newest and fastest operating heavy-duty turret lathe. The machine has a 12-inch spindle bore. An electrically operated chuck wrench is used, the nose of which may be seen at the right-hand side of the chuck.



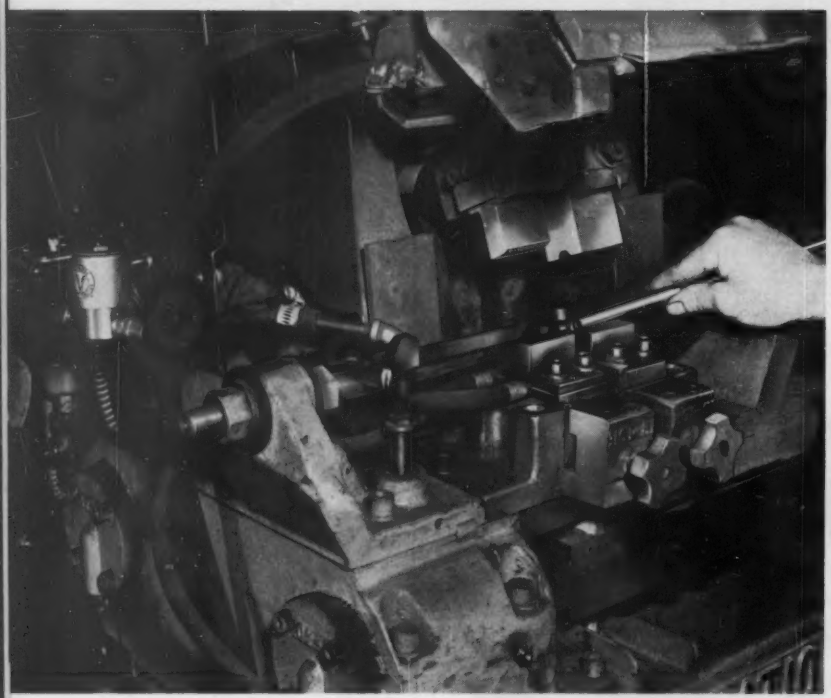
(Right) An aircraft floor panel is being seam-welded on a Sciaky resistance type machine. The corrugated duralumin sheet is fed between two circular electrodes and, as these members contact the work, a continuous button controls, mounted on a seam weld is produced. Push-pendent, are provided for operator convenience.



(Left) Operator guides the head of a routing machine during the profiling of mounting lugs on an aluminum plate. A transparent safety shield is worn by the worker as a protection against flying chips thrown off by the cutter, which rotates at speeds up to 15,000 R.P.M. Cutting fluid is contained in a reservoir mounted on top of the arm.

(Right) Many sheet-metal aircraft components are impact-formed to their desired shapes by means of drop-hammers. Part of a battery of "Cecostamps," which are predominantly used for this type of operation, are shown set up to handle various parts. The frame-to-anvil bolts and springs on the first two machines are recessed for safety.

Rifle Parts Undergo



By KENNETH D. ROBERTS
Assistant Works Metallurgist
Evansville Works
International Harvester Co.

OF the variety of operations performed on parts for the M-1 rifle being produced under contract by the Refrigeration Division of the International Harvester Co., Evansville, Ind., those involving heat-treating are somewhat unusual.

Fusing a forged-steel handle and wrought-steel tube to form the operating rod is performed in a National electric welding machine. Flash is produced, of course, both inside and outside the joint, and has to be removed by subsequent machining. Normally, the flash would be both hard and tough, and tend to dull cutters quickly. To avoid this condition, nitrogen gas from a high-pressure bottle is admitted to the interior of the assembly just before the weld

Fig. 1. (Above) Connection of the tube to a nitrogen supply line is made when the assembly is located in the jaws of the welding machine.

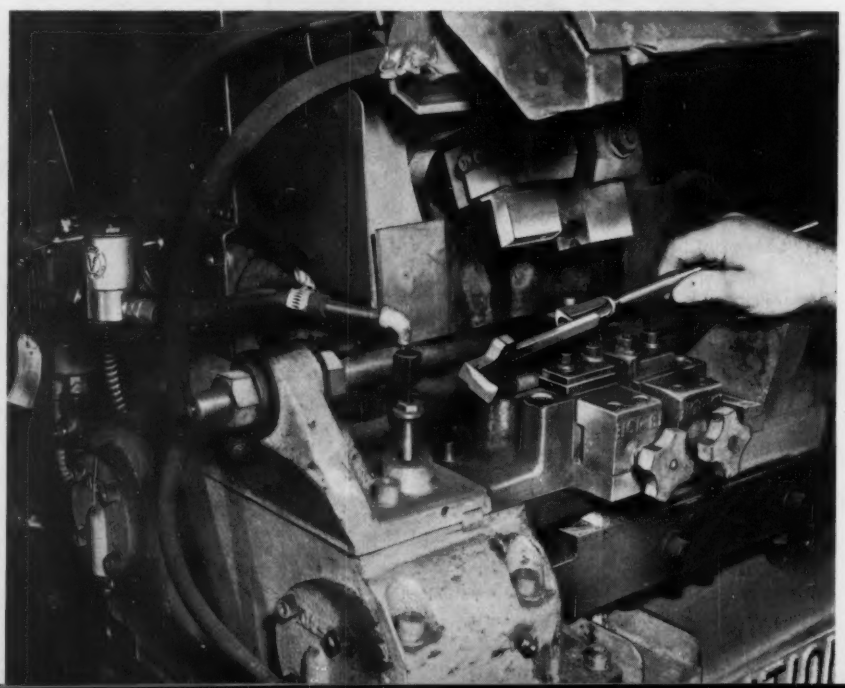


Fig. 2. (Right) The flash around the joint can be seen on the welded assembly. A gas atmosphere reduces flash hardness.

Unusual Heat-Treating

is made. The flash produced in the nitrogen atmosphere proves to be softer than when air alone surrounds the joint.

Views of the welding operation are shown in Figs. 1 and 2. In Fig. 1, the handle can be seen clamped in one jaw, with the tube about to be similarly positioned. In Fig. 2, the weld has been completed, and the work is being removed. Gas flow is controlled automatically by a Skinner solenoid valve seen on the left-hand side of the machine. Interlocked with the electrical circuit of the welder, the valve delivers nitrogen to the joint only during the actual welding. Thus no gas is wasted by a continuous flow. Connection of the tube to the nitrogen supply line is made when the work is clamped in the welder jaws.

To further soften the flash, each assembly is subsequently located in a fixture, Fig. 3, and placed in a Ther-Monic induction heater. In the fixture, a coil surrounding the joint raises the temperature of the flash area to between 1350 and 1400 degrees F. in approximately three seconds, after which the current is shut off automatically and the work allowed to cool. The fixture has two stations — while one station is operative, the other station is unloaded and reloaded.

Drilling and reaming operations follow to size the hole, and flash is readily removed from the inside of the assembly. Flash around the outside of the joint is ground off. Wheel wear is low, since the flash is not hard.

Unusual if not unique is the Lindberg furnace, Fig. 4, which provides for rapidly submerging a heated batch of work in a large sub-floor quenching tank. The illustration shows some of the operating rod assemblies in the furnace vestibule. The heat-treating cycle is performed with the work held vertically. This permits quenching to be progressive and uniform, minimizing the warpage of parts of such thin section.

A curtain of flame separates the outer and inner doors of the vestibule, serving to keep oxygen out of the furnace to avoid the formation of scale. When the outer door is closed after the work-fixture with its load is properly located, a rod extending down through the furnace roof and supported by a mast (seen at the left-hand side of the furnace) is lowered.

At the bottom of the rod, a bayonet connector engages the fixture, which can thus be elevated into the heating chamber of the furnace. The batch remains there until quenching temperature is reached. During heating, the inner door of the vestibule is closed. As a precaution in starting

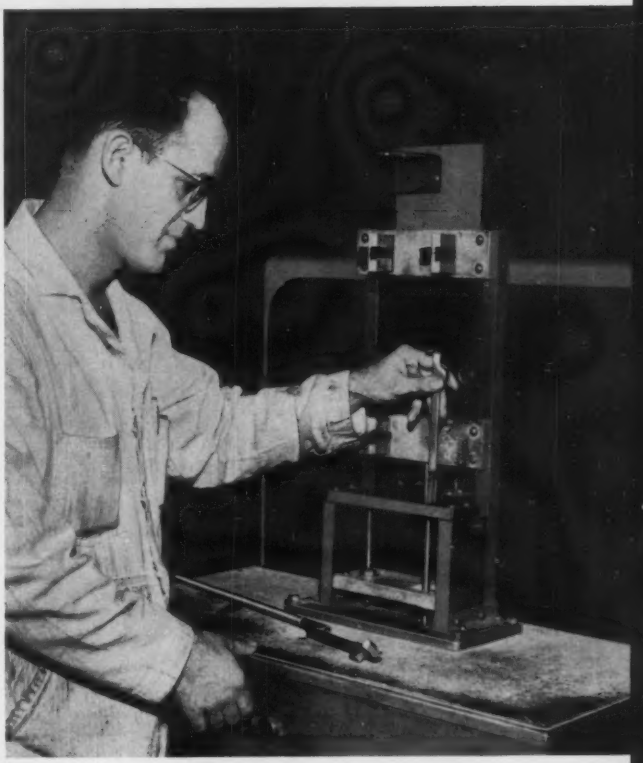


Fig. 3. In this fixture, used to soften the flash, the joint is surrounded by an induction coil.

the furnace, the system is purged with nitrogen. This step removes or dilutes any oxygen present in the vestibule, eliminating the possibility of explosion when the batch is quickly lowered (in three seconds) into the quenching tank.

At maximum depth in the tank, the work-fixture rests on a dolly, and the rod is then disconnected and raised. Next, the dolly is moved in the tank until it is beneath a cable hoist, the top structure of which is visible at the right-hand side of the furnace. Here the batch remains until cool enough to be withdrawn. The hoist operates a rod which, like that in the furnace, has a bayonet connector to engage the work-fixture.

The quenching medium is kept in rapid circulation and passes through a heat exchanger for cooling. While quenching is in progress, the next batch of work is placed in the furnace, so that heat-treating is practically continuous.

Gas cylinders and gas cylinder locks for the rifle are forgings of a hardening grade of stainless steel. Specifications require that they be given a black finish to match other forgings that

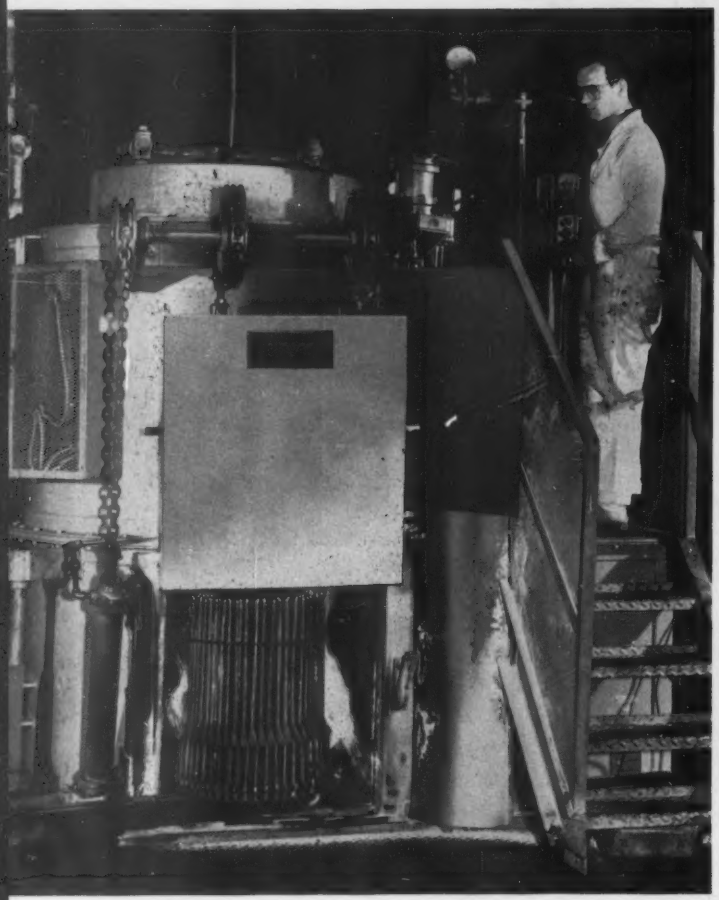


Fig. 4. (Above) A curtain of flame, seen between the doors of the vestibule, excludes oxygen from the furnace.

have received a Parco Lubrite finish. To produce the black coating on the stainless-steel forgings, they are racked, as shown in Fig. 5, and dipped in a sodium or potassium dichromate salt bath in an electrically heated Lindberg furnace.

This bath is held between 750 and 850 degrees F., and a dip of forty-five minutes is sufficient to produce the desired finish when the parts are cooled and washed clean. Besides providing the desired color, the finish increases the corrosion resistance of the work. Care is used, of course, to have the parts free of moisture to avoid steam formation and the possible resulting spatter of hot salts. Coatings produced in this manner make no significant change in the dimensions of the parts treated. Convenience and safety in handling racks of parts into and out of the furnace are promoted by the use of a wheeled mechanical lift, shown in Fig. 5.

* * *

Steel companies consume the bulk of primary nickel distributed to industry in the United States, Great Britain, and Canada, using it principally in the production of stainless-steel, engineering alloy-steel, and jet-engine alloys.

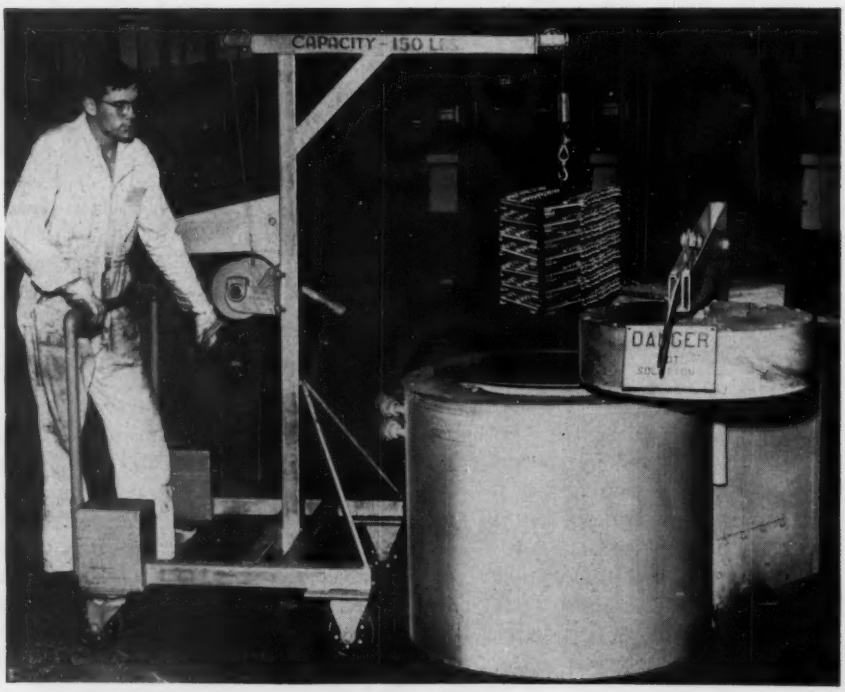
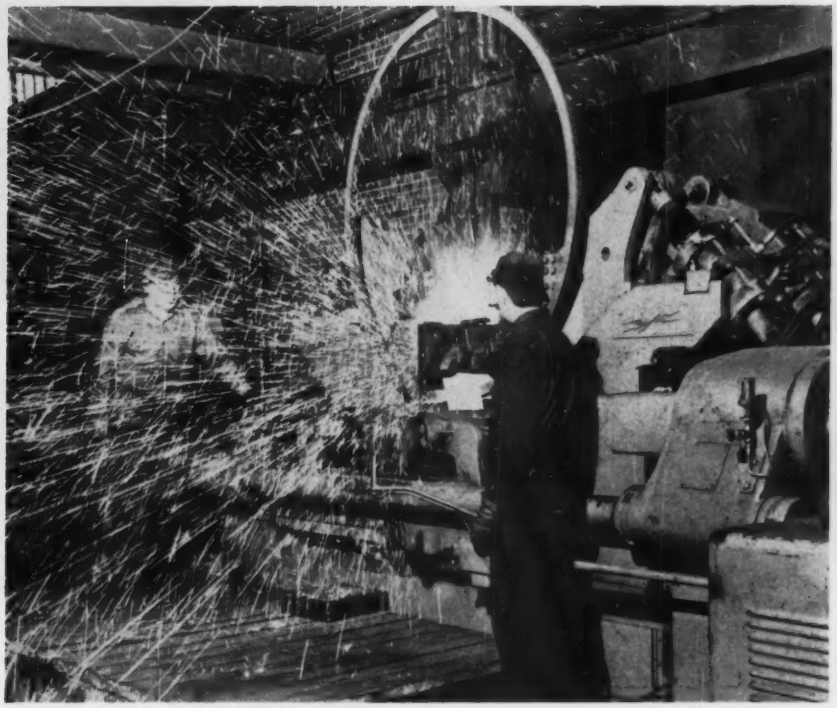


Fig. 5. (Right) A dichromate finish is applied to gas cylinders and gas cylinder locks in a salt bath. Treatment increases corrosion resistance.



Ryan Evaluates Ring Production Methods

RINGS predominate in jet-engine design. From nose cowl to exhaust nozzle, the power plant is a circular, sheet metal affair, strung together with bands of stainless steel. The gleaming rings bolt together combustion chambers, turbine cases, exhaust cones, tailpipes, afterburners, and case weldments. They also serve as housings for bearings and structural bands to reinforce assemblies.

To feed jet-engine production lines, the Ryan Aeronautical Co., San Diego, Calif., buys thousands of rings at a time. Ranging from 5 to 42 inches in diameter, these parts cost almost $1,000,000 annually. Some weigh as much as 350 pounds. Supplied as forgings, castings, or more generally, as formed and flash-welded rolled bars, the rings are flange type, having an L-shape cross-section. In Fig. 1 is shown a variety of these rings. Forgings and castings are received as sleeves, from which several rings are subsequently machined.

At Ryan, they are machined to a tolerance of plus or minus 0.005 inch on both inside and outside diameters, and a surface finish of 63 microinches, r.m.s. In Fig. 2, flanges for afterburner cones, cut from large diameter stainless-steel rings, are being machined on a Bullard vertical turret lathe.

Since they are required to sustain severe structural loads and to withstand intense temperatures, the rings must be of topmost quality. Their cost is commensurately high. Important fabrication techniques on the part of the suppliers, however, are saving thousands of dollars monthly.

Forged rings are produced by flattening a hot, rectangular billet of stainless steel. A hole is then pierced in the center and the disc is laboriously flattened into a large sleeve. Such sleeves possess good physical properties because the metal is roughened by the blows of the hammer. Since forging is not by nature a precision method of forming, a substantial amount of excess metal must be left on the sleeve to provide for machining. This metal must be paid for before it is thrown away, and because machine time is high, forged rings are relatively expensive. However, they are readily available and are used when procurement time is limited.

In the case of cast rings, both excess metal and machine time are less formidable factors. While

Fig. 1. A typical variety of the rings required by a jet engine. Forgings and castings are received as sleeves, and are later parted into rings.

costing initially 30 per cent less than forgings, their physical properties are not as good. Also, castings may be porous or contain occlusions that make them useless. These defects, not detectable by X-ray, often remain hidden until uncovered after extensive machining operations.

With both forged and cast sleeves more metal is removed by machining than is left in the finished ring. Since these items are purchased on a weight basis, the scrap involved costs more than the metal in the machined rings. In addition, the weight of the scrap is reflected in the transportation charges incurred from the forge shop and foundry.

New methods for flash butt-welded large stainless-steel sections now make it possible to obtain

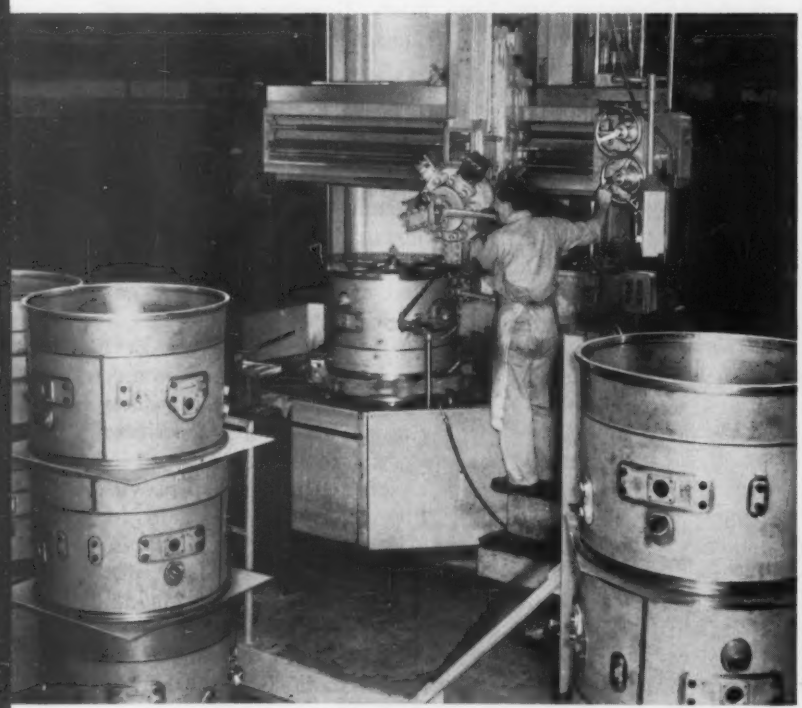


Fig. 2. A vertical turret lathe operation in the finishing of flanges for afterburner cones. Some of the rings are machined to the required specifications on gap lathes.

quality rings at lower costs than by either forging or casting. Bar stock lengths are first bent into D-shapes on a bulldozer or rolling machine, and the ends are then butt-welded together. The heading illustration shows such a welding operation in progress on a Taylor-Winfield machine. This is the only way of welding such sleeve sections to the exacting requirements of jet-engine fabrication.

After excess weld metal is removed by a chip hammer, the ring is annealed in a furnace and squeezed into circular shape. While still hot, it is placed on an expanding mandrel and sized, as in Fig. 3. In addition to possessing excellent physical properties, these rings have a decided cost advantage. They are approximately 45 per cent cheaper than forged rings, and 22 per cent cheaper than cast rings.

Welded fabrication is not limited to rectangular bar lengths. For the use of steel mills Ryan has purchased special rolls that have a cross-section conforming closely to desired ring dimensions. Only finish machining is required, as there is not much metal to remove. Rings produced on such sections have the advantage of a grain structure developed along the part contours.

Frequently, mill sections are "Siamese twin" shaped. Two rings can be made from each such section. In rough machining, one ring serves as a good clamping area while the other is being cut. Subsequently, the rings are parted and finished.

Sections are now also being produced by the Ugine-Sejournet extrusion process. This is a fairly new technique, in which the billet and press mandrel are covered with fiber glass, and a glass cartridge is placed against the die. The glass film acts as a lubricant, preventing metal-to-metal contact. In two to four minutes, sections up to 40 feet long can be extruded. Because of the low cost of the dies compared with steel mill rolls, and the ease with which they can be employed, extrusions show promise of being used extensively for jet-engine rings. However, other factors, such as die life, must be considered in determining whether a particular run can be obtained more economically by this process.

* * *

Machine Tool Survey in Naval Shipyards

A program for the replacement of obsolete machine tools in United States Naval Shipyards has been started at the Bureau of Ships. This program involves a critical review of machine tools having a value of over $150,000,000. The survey is being conducted in order to plan a replacement program, and such factors will be taken into consideration as obsolescence, productive capacity, product quality, maintenance costs, floor space, power requirements, and disposal value. Instructions for implementing the program were formulated at a two-day conference attended by representatives from shipyards and the machine tool industry. It is intended to replace obsolete machine tools over a five-year period.

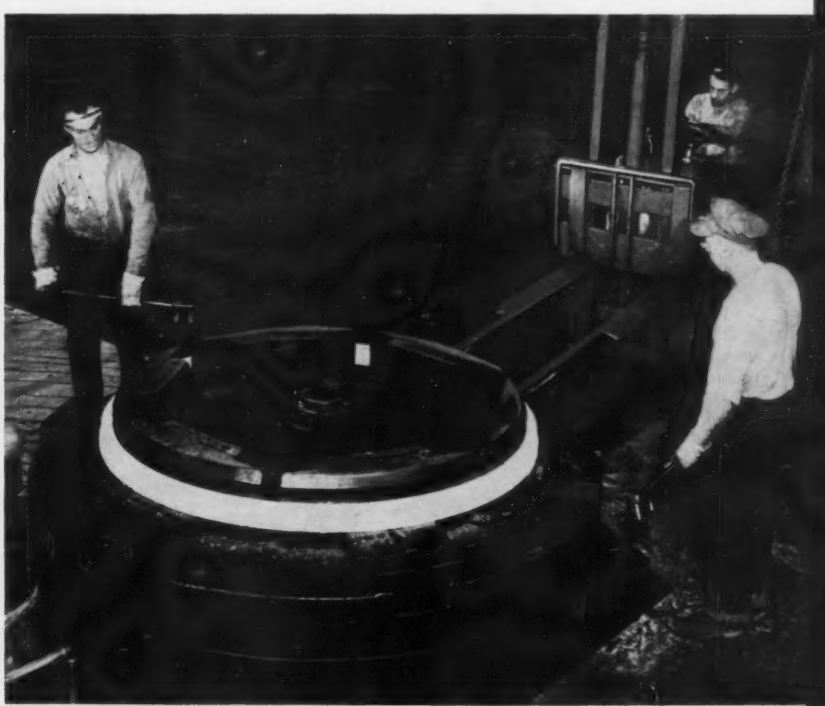


Fig. 3. The ring is heated and sized on a powerful expanding mandrel, after being flash butt-welded, annealed, and squeezed into a circular shape.

Shell Machining Operation without Manual Labor

A TWENTY-SECOND, fully automatic machining cycle figures prominently in the expanded shell-producing capacity of National Presto Industries, Inc., Eau Claire, Wis. The cycle involves the boring, facing, and chamfering of the nose end, and the forming of the band grooves of 105-millimeter shells. The operation is performed on a new battery of eighteen Fay 8-inch automatic lathes. Integral automation designed and furnished by the machine tool builder dispenses with all manual labor in the cycle.

A close-up view over the bed of one of the machines prior to its installation in the Presto plant is shown in Fig. 1. The cold-drawn shells roll down to a delivery table behind the lathe. In final installation, the Fay lathes will be a part of a complete transfer line. After a shell has been machined, it is unchucked and shifted to a table in front of the lathe. Simultaneously, a rough forging is lifted from a table in the rear of the machine and chucked.

In the illustration, the machining of a shell *A* has just been completed. During the operation, the shell is gripped on its boat-tail by the jaws *B* of a universal chuck. Outboard support of the work is provided by a steadyrest *C* mounted on a slide. A multiple-lip cutter *D* on the end of a bar *E* carried in bearings on the steadyrest slide bores, faces, and chamfers the nose. Cutters on the front carriage *F* and back arm *G* form the band grooves.

The handling mechanism comprises two symmetrical transfer units, each having a pair of fingers *H* which grasp the work. The units operate together, pivoting on hinges *J* and moving transversely along a cross-rail *K*. A hydraulic pump and motor located at the headstock end of the lathe supplies power for the mechanism, as well as for actuating the chuck jaws, the steadyrest slide, and an ejector *L* within the chuck.

The automatic cycle is as follows: With the spindle stopped and the tooling retracted, the transfer units pivot down, and the two pairs of fingers fall into position and grasp the machined shell *A* and the unmachined shell *M*. Then the chuck jaws open, and the ejector pushes out the machined shell. Both transfer units next pivot up, in the position shown in the illustration.

Now, the transfer units move forward on the

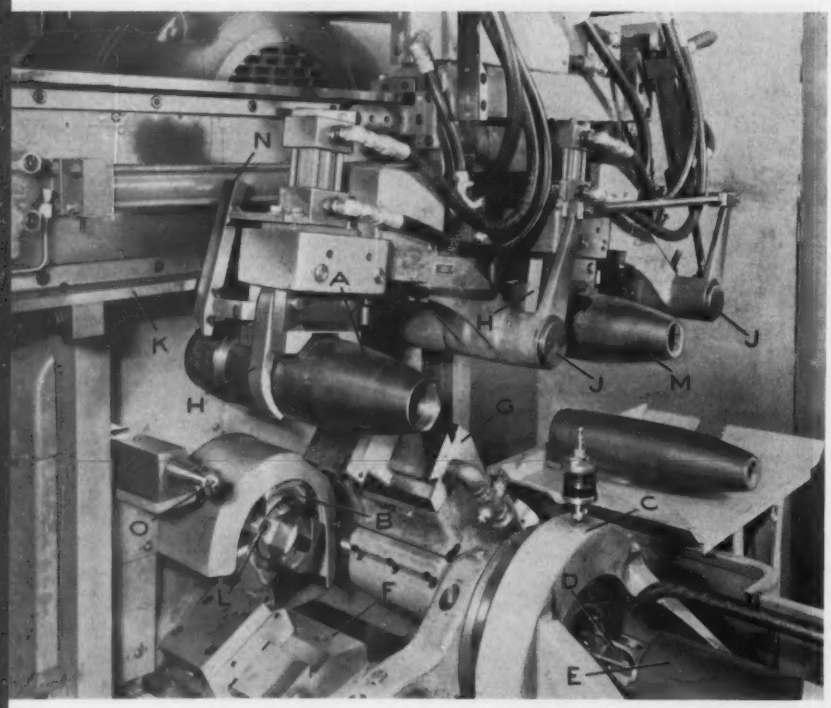


Fig. 1. The work-handling mechanism simultaneously shifts a completed shell to the front of the machine and delivers a new shell into the chuck.

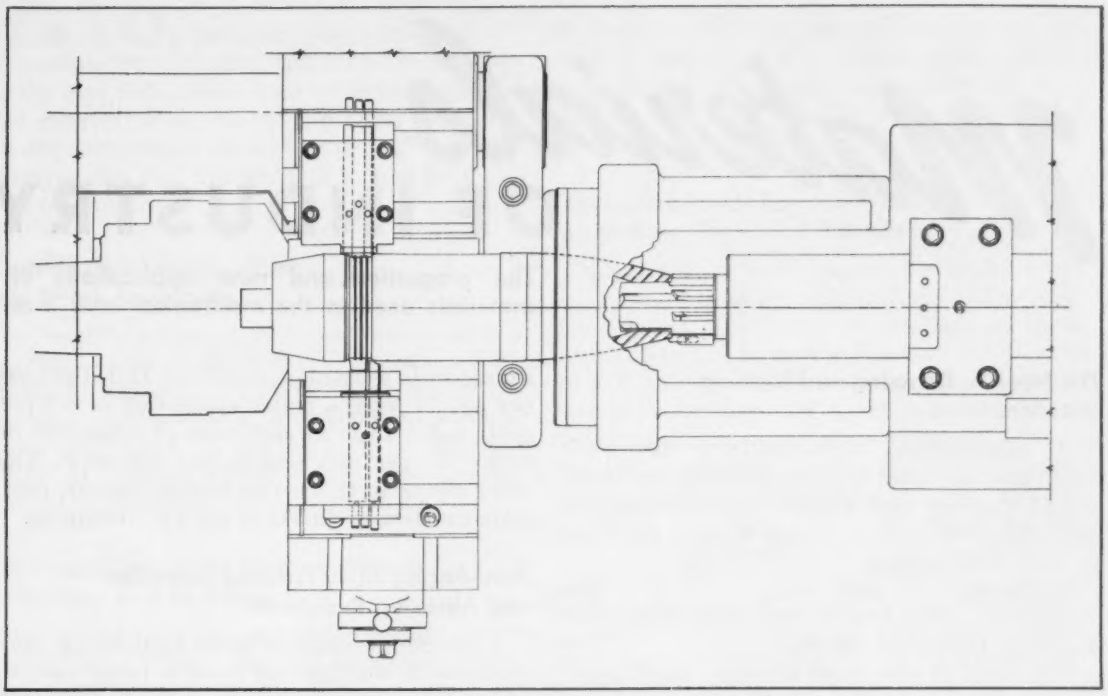


Fig. 2. This drawing shows the arrangement of the cutters for machining the nose end and the band grooves of the shell.

cross-rail, again pivoting down when shell *A* is over the unloading table and shell *M* is over the chuck. Shell *M* is then forced automatically into the chuck jaws. At this point, both shells are released from the fingers, and the units pivot up.

The spindle begins to rotate, and the cutting elements execute rapid traverse and feed movements under the direction of cams and formers to complete the cycle. During the machining, the transfer units move back on the cross-rail to their initial position.

To avoid scoring the shell by the fingers when being ejected from, or forced into, the chuck, the finger assemblies have a slight compensating movement built in. This movement is set up when either unit is in position over the chuck; a cam bar *N* intersects a roller *O* as the unit pivots, and the finger assembly is thrust out against spring pressure. A drawing of the arrangement of the cutters is shown in Fig. 2.

* * *

Silver Consumed in Photographic Emulsion

According to the Eastman Kodak Co., about 10 tons of bar silver are used each week in the manufacture of its photographic materials. This rate of consumption is said to rank second only to that of the United States Mint.

Aluminum Foil Protects Watch Springs during Heat-Treatment

Aluminum foil, commonplace in the home as a protective wrapping material, is finding increasing application in industry. A new use reported by Hamilton Watch Co., Lancaster, Pa., is wrapping trays of its Dynavar mainsprings in foil before heat-treating. The watch mainsprings are cleaned, then wound in clean nickel rings. The rings are then placed in nickel trays, stacked, and wrapped in Reynolds Wrap. Each package, about 10 inches long, 6 inches wide, and 2 inches deep, has approximately 5000 mainsprings.

The foil is used as a precautionary measure to keep the springs clean until they are placed in a vacuum furnace. Also, it protects the springs' bright finish from oil or vacuum leaks which might cause discoloration during the four hours they are heat-treated. The watch firm also uses the foil to protect its dies, tool steel parts, and machine components during tempering.

Wrapping the parts in Reynolds Wrap before tempering—at temperatures below the melting point of the wrap—prevents atmospheric discoloration and contamination of the parts. This retains the bright finish of the heat-treated parts and eliminates a cleaning operation which might otherwise be necessary.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Die Steel for Drawing and Forming Stainless Steel

A high-carbon, high-vanadium die steel, specifically designed for deep-drawing and forming of stainless steel without galling or pick-up and with good wear resistance, is being produced in bars and forgings. This die steel, known as "Ottawa 60," has been made available by the Allegheny Ludlum Steel Corporation, 2020 Oliver Building, Pittsburgh 22, Pa.

This steel is comprised of many hard, abrasion-resistant vanadium carbides dispersed uniformly through a hard matrix when heat-treated. Its typical analysis is: carbon, 3.25 per cent; chromium, 1 per cent; molybdenum, 1 per cent; vanadium, 12 per cent; and the balance, iron. The steel may be forged, annealed, hardened, and tempered. Machining and cutting are performed using conventional methods other than hack- or band-sawing. It does not machine so well as high-carbon, high-chromium tool steels. In grinding, the use of aluminum oxide or diamond wheels is recommended. In polishing, diamond dust proves very satisfactory. Use of techniques developed in grinding sintered tungsten carbides will insure proper results.

Metal-Containing Resins for Industrial Tooling

Metal-containing resins that can be shaped into complex parts using both casting and laminating techniques are being offered by Aries Laboratories, Inc., 270 Park Ave., New York 17, N. Y.

These resins can be sawed, drilled, tapped, polished, and machined and are used to make jigs and fixtures, masters and models, foundry items (such as patterns and match plates), and plastic forming dies and molds.

One of these resins, containing aluminum, is known as "Aritemp Plasti-Metal 707." This two-component, epoxy-base resin has the following physical properties: a density of 105 pounds per cubic foot, a hardness (Barcol) of from 35 to 40, a compressive strength of 20,000 pounds per square inch, a tensile strength of 11,000 pounds per square inch, a water absorption of 0.2 per cent, and a thermal coefficient of expansion of 0.0000037 per unit length, per degree F. The other resins in this series contain copper, iron, stainless steel, or quartz in place of aluminum.

Hard-Facing Alloy Provides Corrosion and Abrasion Resistance

A chromium-cobalt-tungsten hard-facing alloy available in welding rod form is being used to impart high impact strength, and corrosion and abrasion resistance to edger rolls, swaging mandrels, and hot-work tools.

When deposited by an oxy-acetylene torch, "Walloy No. 6," as the alloy is called, exhibits a hardness of 40 to 44 on the Rockwell C scale, a tensile strength of 105,000 pounds per square inch, and a specific gravity of 8.3. The melting point of this alloy is 2325 degrees F. It is said to resist chipping and spalling and to have some ductility, while still retaining these qualities at red heat. Deposits of the material can be ground to a high finish.

Edger rolls and swaging mandrels, engine exhaust valves and seats, hot-casting stripper bits, and such hot-work tools as punches, dies, shear knives, and blades may suitably be hard-faced with this alloy. An advantage claimed for the material when it is used in hot-work applications is its ability to hold a cutting edge. The material is obtainable from the Wall Colmonoy Corporation, 19345 John R St., Detroit 3, Mich.

Vinyl-to-Metal Laminate Coil Now Available

A vinyl-to-metal laminated material that combines the corrosion resistance of vinyl plastic with the formability of metal is being made in coil form by the Enamelstrip Corporation, Allentown, Pa. "Marvibond," as it is called, can be deep-drawn, sheared, crimped, bent, embossed, drilled, roll-formed, and punched without damage to the coating or the bond. The vinyl will not chip, crack, or flake off.

Coils up to 20 inches in width are available in commercial coil gages with steel or aluminum as the base metal. Users may fabricate industrial and commercial equipment and parts employing all the advantages of automatic feed and progressive dies that are common to regular metal coil fabrication.

Carbide that Exhibits Wear and Shock Resistance

A recently developed sintered carbide, with a hardness of 92 on the Rockwell A scale, a high strength, and good wear and shock resistance, has been made available for steel milling applications. The name of the carbide is "Firthite TXL." It is being marketed by Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Chromate Conversion Coating Protects Aluminum and Its Alloys

Protection for aluminum and aluminum alloys by employing Proseal No. 16, a chromate conversion protective coating, has been announced by the Promat Division, Poor & Company, 851 Market St., Waukegan, Ill. This coating is said to effectively inhibit corrosive action between paint and aluminum and is designed for any application where extruded, forged, wrought, or cast aluminum and its alloys are used.

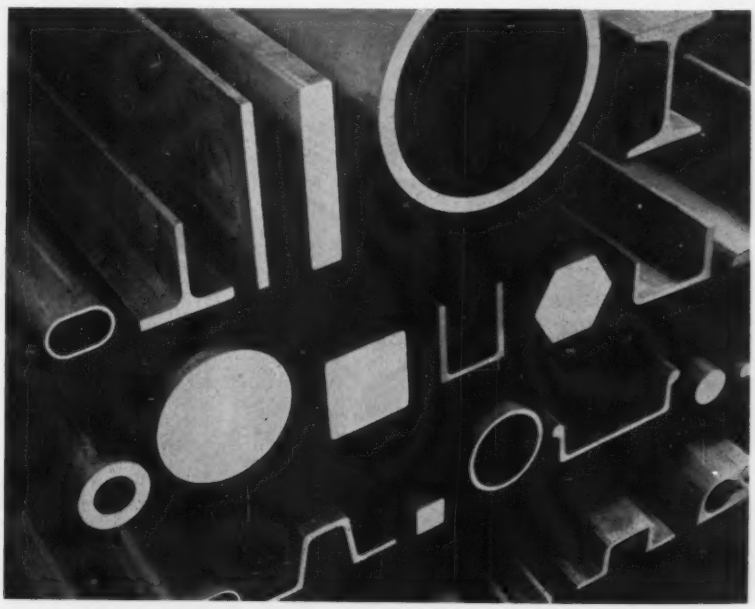
Panels treated with the coating have shown no change in physical properties after five hundred hours of exposure to 20 per cent salt-spray solution at 95 degrees F. Advantages claimed for the coating are: greater control over uniformity of film; low material cost; suitability for production coating of any aluminum component; provides high protection from corrosion when used alone or as a base for paint; and requires no expensive equipment for application.

Fabrication Made Easier by Using Magnesium Sheet and Extrusions

Magnesium, in the form of rolled plate, is now being used for tooling applications and product manufacture. The metal is available in thicknesses of from 1/4 inch to 3 inches and in sizes up to 6 feet wide by 24 feet long; and in a wide variety of standard and special extruded shapes, including angles, bars, tubes, channels, I-beams and rectangles (see the accompanying illustration). Maximum dimensions of an extrusion would be any shape fitting into a 10-inch circumscribed circle and up to 85 feet in length.

The deviation in flatness of the rolled plate in a thickness range of from 0.250 to 1.000 inch is 0.005 inch in any 1 foot and 0.015 inch in any 3 feet; in a thickness range of from 1.001 to 3.000 inches, 0.010 inch in any 1 foot and 0.030 inch in any 3 feet. Typical mechanical properties are: a tensile strength of 35,000 pounds per square inch, a tensile yield strength of 19,000 pounds per square inch and a compressive yield strength of 10,000 pounds per square inch.

Features favoring the use of the plate are its flatness which simplifies fabricating and minimizes machining; its toughness and freedom from porosity (properties which extreme working have imparted to the plate); and dimensional stability during and after machining which has



A representative sample of extruded magnesium shapes available from the Dow Chemical Co. Maximum dimensions are limited to shapes fitting into a 10-inch circumscribed circle and 85 feet long.

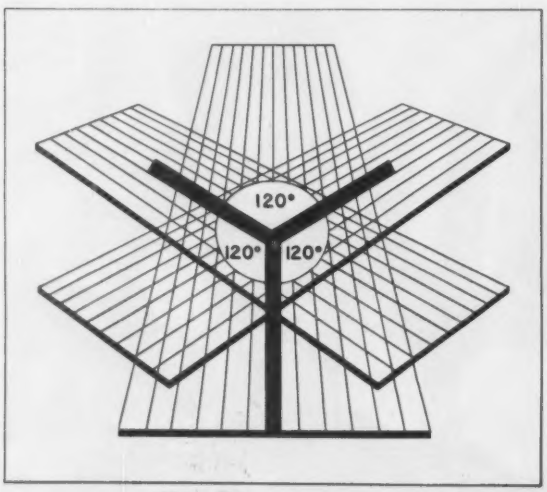
been insured by stress-relieving above 700 degrees F. The Dow Chemical Co., Midland, Mich., who is offering these plates and extrusions suggests the following uses for the products: checking fixtures, bases, and gages assembly and locating jigs, fixtures, and bases; routing and drill jigs; fusion and spot welding jigs and fixtures; adhesive bonding fixtures; and vibration test fixtures. Other uses for magnesium plate alone include contour boards, stretch form blocks, alkaline resistant bases for master plasters, molds for fibrous glass and plastic parts, and bases for plastic stretch blocks.

Glass-in-Plastic Laminated Sheeting Combines Strength with Moldability

A high-strength, uniform-quality glass-in-plastic laminated sheeting that is moldable by using ordinary methods for making structural members and parts in the aircraft, automotive, and allied industries has been announced by the Minnesota Mining & Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn. The material, known as "Scotchply" reinforced plastic, consists of one or more uncured (unhardened) moldable sheets of plastic. Each sheet is integrally reinforced with lineally aligned, continuous glass filaments. The accompanying illustration shows how three sheets of the plastic may be laminated together at 120-degree angles to give them equal strength in all directions in the laminating plane.

The plastic is adaptable for the matched metal or plastic die method of molding, but it can also be processed into its final state by any of the other commonly known molding techniques in use today, including the pressure- and vacuum-bag methods. The curing time is thirty-five minutes at 330 degrees F. under a molding pressure of 25 pounds per square inch. The curing time can be shortened considerably by operating in a 350 to 450 degree F. temperature range.

When laminated at 120-degree angles, the material exhibits the following physical properties: a tensile strength of 41,000 pounds per square inch, a flexure strength of 64,500 pounds per square inch, a compressive strength of 42,000 pounds per square inch, and a dielectric strength of 700 volts per mil. The material is also unaffected by the usual industrial acid or alkaline atmospheres and salt air. It can be sawed, sheared, punched, drilled, sanded, painted, cemented, and polished.



This three-ply glass-filament reinforced plastic, exhibiting high strength and uniform quality, can be used in making structural members and parts in the aircraft, automobile, and allied industries

Zinc Phosphate Coating Material for Iron and Steel

"Oakite CrysCoat SW," a zinc phosphate coating material for iron and steel designed for use in pressure-spray washing machines, has been announced by Oakite Products Inc., 126 Rector St., New York 6, N. Y. The weight of this coating ranges from 180 to 220 milligrams per square foot. Among the advantages claimed for it are the following: the coating develops very rapidly on metal surfaces, particularly in deep cavities, eliminating rusting difficulties; it is fine-grained, dense, and relatively non-porous; the solution is buffered for long life; and the upkeep required to maintain an operating solution is the material itself—no toners or additives are needed. Upkeep is determined by a simple titration procedure using equipment supplied free of charge by the manufacturer.

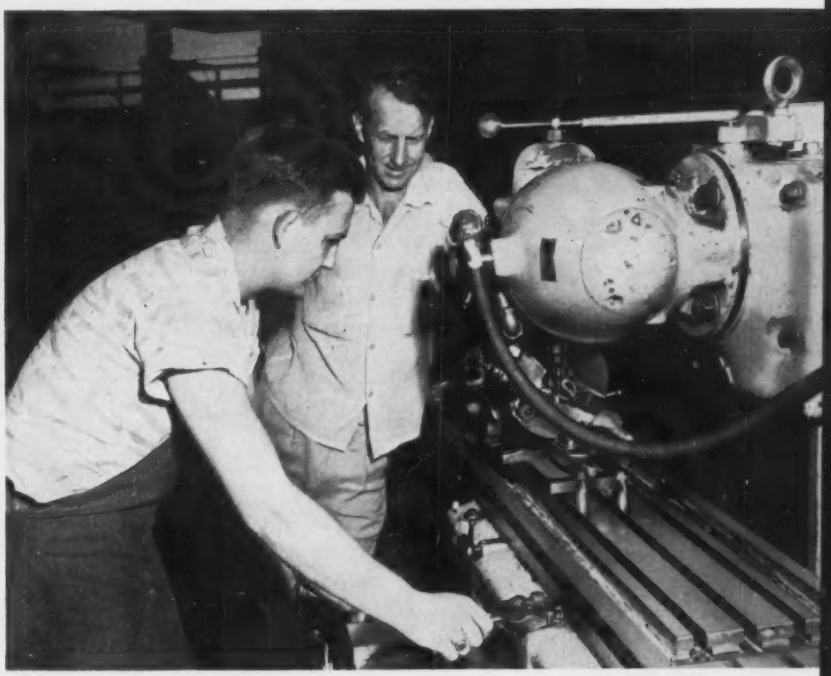
Stainless Steel that Resists Nitric-Hydrofluoric Acid Mixtures

Great resistance to certain nitric-hydrofluoric acids has been shown by a stainless steel developed by the Carpenter Steel Co., Reading, Pa. The ability to resist these acids makes it useful for equipment where such corrosive liquids are handled in pickling or similar operations.

The nominal analysis of Carpenter stainless "No. 7-Mo" (Type 329), as it is called, is: carbon, 0.20 per cent, maximum; chromium, 27 per cent; nickel, 4 per cent; molybdenum, 2 per cent; and iron, the balance. Although nitric and hydrofluoric acids can be handled separately by stainless steels and some non-ferrous alloys, respectively, this stainless steel is claimed to be the first metal to have commercial resistance to an extremely corrosive mixture of these strong acids.

Industry Training Pattern Set by Lockheed

By Reginald Perry
Information Representative
Bureau of Apprenticeship
United States Department of Labor



MANPOWER requirements in the aircraft industry remain high. A 137-wing goal is scheduled for the United States Air Force and hundreds of civilian passenger planes and freight carriers must be built during the next few years. It is safe to say that the industry will have to produce about 1100 planes a month for some time to come. The prospective output will call for an adequate force of trained personnel.

Training will be required for the all-round work performed by craftsmen in the various trades, and also for the assembly line and other jobs required in production. Not only must new recruits be trained, but seasoned workers must be orientated periodically in the new production methods occasioned by changing aircraft designs. These designs have been called "as perishable as eggs."

That the industry realizes the need for training is reflected by the large number of establishments in which long-term apprenticeship programs are in operation. Also, in many instances, there is over-all training in effect at all levels of occupations. This instruction has been termed "skill-improvement" by the Bureau of Apprenticeship, United States Department of Labor.

Lockheed Aircraft Corporation has an outstanding training system which has been widely used as a pattern by other companies. The apprentice training program was established in its Burbank, Calif., plants in 1939, with the assistance of the field representatives of the Bureau of Apprenticeship in cooperation with the California Apprenticeship Council. In 1952, a similar program was launched in the company's newly acquired Marietta, Ga., plants. In addition to the all-round training given to apprentices, instruction is given to other personnel in a long list of occupations that require various degrees of skill and ability.

Each year since the inception of the program a large number of apprentices have completed training. The vast majority of them now work for the company either as journeymen aircraft mechanics, machinists, or other craftsmen, or as members of supervisory or technical staffs. Among the latter two groups are plant supervisors, tool designers, tool engineers, flight engineers, instructors, and an apprenticeship coordinator. In February of this year, there were in training a total of 154 apprentices: 120 in the Burbank plants, and the rest in the Marietta plants. Several hundred other workers were trained for assembly-line jobs, or for a wide variety of other jobs, including tooling, sheet-metal fabrication, parts processing, electrical wiring, and inspection. Then too, 500 skilled

workers of long experience—journeymen, foremen, and others—received the advantages of special skill-improvement training. In the Burbank plants there was a total of approximately 20,000 workers in all, including seasoned workers and new recruits; and in Marietta, 15,000 workers. Because of the similarity of the two apprenticeship programs, an outline of the program followed in the Burbank plants can serve as an example.

A joint apprenticeship committee functions in an advisory capacity. This committee represents the management and the Aeronautical District Lodge, International Association of Machinists. Among the apprentices employed in Burbank, sixty-six are acquiring the skills of the machinist, tool and die maker, and jig and fixture builder; and fifty-four are mastering the jobs of the aircraft and the engine service mechanic.

More than ninety apprentices in Lockheed plants are veterans who served in Korea or were on the fighting front during World War II. Approximately 20 per cent of them came from flight units. This experience gave them a technical knowledge of aircraft construction, as well as a special enthusiasm for getting started in the industry. Those with actual mechanical experience obtained commensurate credit so that their training was speeded. (Without previous experience, it takes the apprentice four years to reach journeyman status.)

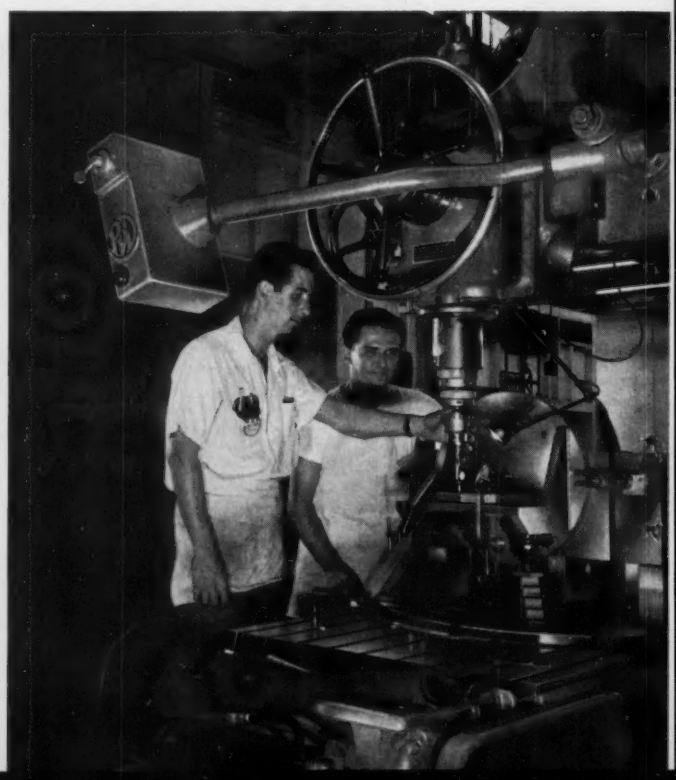
Apprentices to a large extent pay their own way, because they contribute to production almost from the very start of their training. They work side-by-side with the journeyman, under the guidance of a supervisor and a foreman, or under other skilled workers to whom they are assigned.

The work schedule for machinist apprentices is as follows:

	Hours
Tool crib	160
Drill press	200
Hand milling machine	160
Turret lathe	700
Bench work	200
Shaper	400
Planer	400
Machine inspection	80
Template work	160
Machine layout	320
Engine lathe	1200
Milling machine	1200
Horizontal boring mill	500
Profiling machine	240
Jig borer	160
Broaching machine	80
Tool and cutter grinder	380
Precision grinding machine	400
Machine repair	200
Heat-treatment	80
Tool inspection	120
Foundry	40
Tool design	160
(Unscheduled)	204
Total	7744

A machinist apprentice is being instructed in reproducing a punch from a master on a profiler.

A supervisor assists the neophyte in aligning a plate on a Pratt & Whitney jig borer.



The tool and die maker apprentice is shown how to check the location of a hole in a drill jig.

Those training for all-round work as aircraft and engine service mechanics follow the schedule given below:

	Hours
Tool crib	80
Hand forming and trimming	120
Processing of parts and paint primer	120
Template work	120
Sheet-metal sub-assembly	120
Fuselage and empennage assembly	240
Wing assembly (inner and outer)	240
Plumbing fabrication and assembly	240
Electrical fabrication and assembly	240
Final assembly:	
Trim 80	
Constellation project 700	
P2V project 700	
Jet project 480	1960
Inspection (final shakedown)	80
Production flight and service:	
Aircraft overhaul 700	
Constellation project 440	
P2V project 440	
Jet project 300	
Experimental 440	2320
Cable splicing	40
Steel fabrication and welding	200
Engine overhaul and testing	400
Wood, fabric and doping	120
Final paint and fabric	80
Airplane service and repair	1024
Total	7744

In addition to the 7744 hours of training in the schedules itemized, every apprentice has the benefit of 576 hours of related classroom instruction. He attends classes three to four hours a week. During this time, he is paid his full hourly rate. The related instruction is given in the Burbank high school.

The following subjects are included in the curriculum: blueprint reading; mathematics, trigonometry, and physics related to aircraft production and maintenance; durability and strength of materials; elements of supervision; employer-labor relations; industrial communications; economics, history, and development of aircraft industry; safety methods and regulations; and workmen's compensation laws. Motion pictures and slide films, cut-away units, mock-up installations, and charts are frequently used to clarify technical points. Apprentices also have the advantages of the plant's excellent technical library.

Compensation for the starting apprentice amounts to 60 per cent of the journeyman hourly rate. Semi-annual increases bring his pay to 92 per cent of that of the journeyman during the final six months of training. Qualified veterans are eligible for the monthly training allowances provided by the re-enacted G. I. Bill. There is financial assistance available to the veteran partially handicapped by a service-connected injury. This aid is provided by the Vocational Rehabilitation Act. There is also subsistence allowance and other training benefits.

Before an applicant is accepted for apprenticeship, he is given a battery of tests and interviews to determine his mechanical aptitude, judgment,

The apprentice jig and fixture builder inspects a production fixture while his supervisor looks on.

and reasoning power. Educational background and previous mechanical experience are factors in his being accepted. Enrollment age of apprentices ranges from eighteen to twenty-three years, except in the case of veterans, who may enter up to the age of twenty-seven. Those who are accepted sign a formal agreement. There is a probationary period of not less than 500 hours, and during this time the agreement may be cancelled.

Throughout the entire term of apprenticeship the ability and progress of the trainee are determined and recorded. On-the-job performance is tested and graded twice a month by the shop supervisor on the basis of quality of workmanship and production, as well as on learning ability, dependability, and attitude. Frequent quizzes and tests keep close check on classroom progress. At the successful conclusion of the four-year period, the apprentice receives a certificate of completion.

Machinery Replacement Programs Described in Booklet

A booklet describing machinery replacement programs used by several well-known American manufacturers is available from the Rockford Insert Group, manufacturers of metal-working machinery. This publication, unique in its subject and scope, will be of especial interest to the metal-working industry as it presents programs used by progressive companies who have found them helpful in purchasing machinery.

Such programs serve as a means of eliminating guesswork in purchasing, and help fight the rising costs of manufacturing. Several of the capital investment programs reported are based on the recommendations of the Machinery and Allied Products Institute for scientifically determining the economic advantage of new equipment; other programs are modifications.

Included among the companies whose machinery replacement programs are outlined in the booklet are: Allis-Chalmers Mfg. Co., Sundstrand Machine Tool Co., DoAll Co., Rockwell Mfg. Co., Chain Belt Co., Taft-Peirce Mfg. Co., Barber-Colman Co., Caterpillar Tractor Co., and Clearing Machine Corporation.

The description of the Allis-Chalmers machinery replacement program includes a reproduction of the simple Capital Equipment Replacement Analysis form employed. Reduction in the factory cost ratios in their various plants is cited, and it is stated that the dollar savings resulting from them during the last three years has more than paid for the programs.

Other companies stress the fact that a sound formula for replacing capital equipment is essential to systematically determine the sequence of replacement that should be undertaken, and which purchases will provide the most return on invested dollars. In the booklet, the Chain Belt Co. reports an additional important benefit from keeping machinery modern is that good operators can be attracted and kept. This, in turn, reduces spoilage of parts to a minimum. All companies agree that a dynamic equipment modernization policy does pay dividends in actual dollars and cents savings.

Copies of the booklet "Machinery Replacement Programs" can be obtained from the following companies in the Rockford Insert Group:

American Broach & Machine Co., Division Sundstrand Machine Tool Co., Ann Arbor, Mich.
Barber-Colman Co., Rockford, Ill.
Hendey Machine Division, Barber-Colman Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
John S. Barnes Corporation, Rockford, Ill.
W. F. & John Barnes Co., Rockford, Ill.
Eckstrom, Carlson & Co., Rockford, Ill.
Greenlee Bros. & Co., Rockford, Ill.
Ingersoll Milling Machine Co., Rockford, Ill.
Mattison Machine Works, Rockford, Ill.
Rehnberg-Jacobson Mfg. Co., Rockford, Ill.
Rockford Machine Tool Co., Rockford, Ill.
Sundstrand Machine Tool Co., Rockford, Ill.

Tracer-Controlled Turning Increases Lathe Production

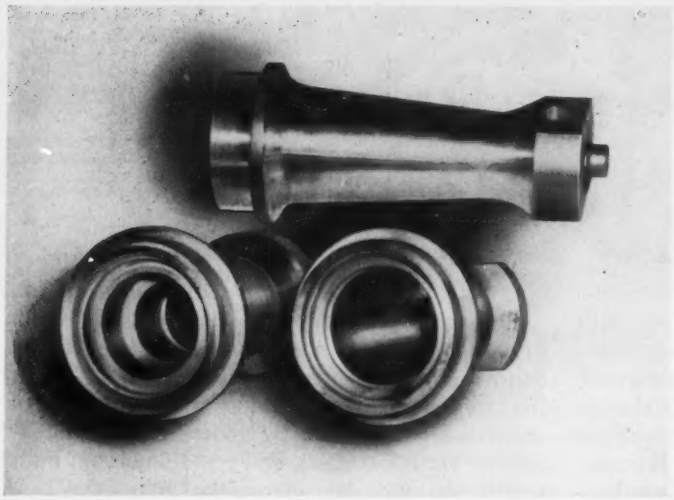
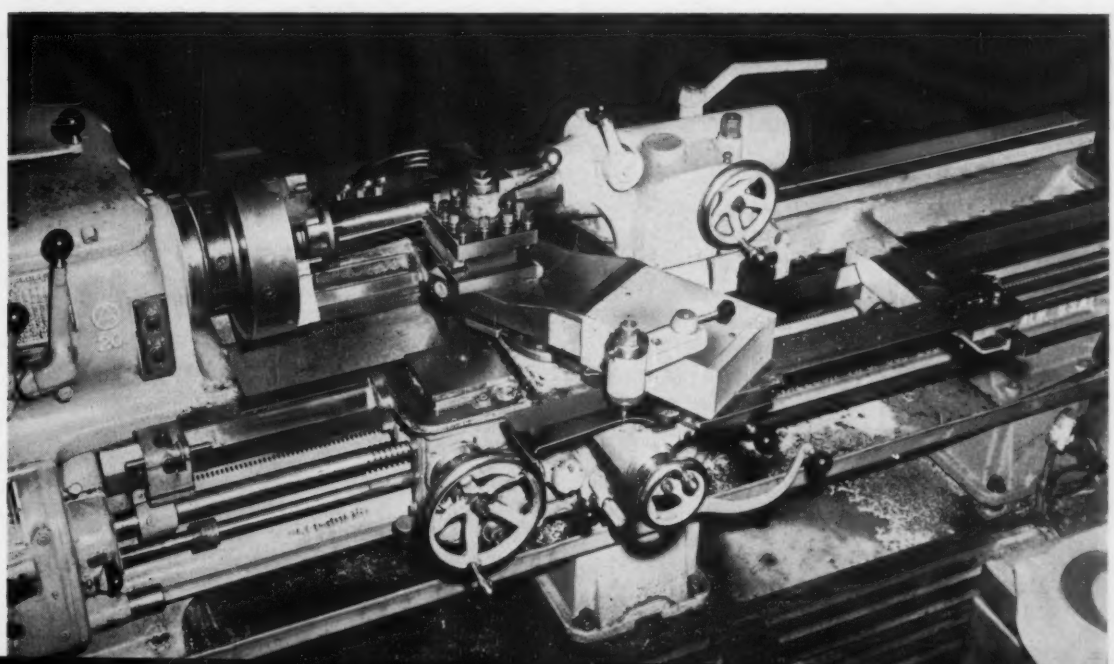


Fig. 1. (Left) Aircraft landing-gear struts which are completely machined in 40 minutes on a tracer-controlled lathe as against 328 minutes on an engine lathe equipped in the conventional manner.

Fig. 2. (Below) Machining the external contour of an aircraft landing-gear strut with the movement of the tool controlled from a template seen on a carrier at the front of the bed.

MANUFACTURING costs have been reduced and production greatly increased in several operations being performed on Axelson engine lathes equipped with the recently developed Trace-O-Matic hydraulic tracer attachment. For example, in turning a forged aircraft landing-gear strut of the type shown in Fig. 1, the time formerly required for roughing and finishing one strut was 328 minutes. Now a lathe equipped with the Trace-O-Matic, illustrated in Fig. 2, does the work in 40 minutes, carbide-tipped tools being used. The strut is made of S A E 4340 steel and has a hardness of 260 Brinell.

Cuts up to 3/8 inch deep are taken in this operation and tolerances as close as plus 0.003 inch minus zero are maintained. The cuts are taken with single-point tools, and are template-controlled for all contours, fillets, cylindrical surfaces, and tapers. After the tools have once been correctly set for turning to any one diameter, the machine will automatically produce all



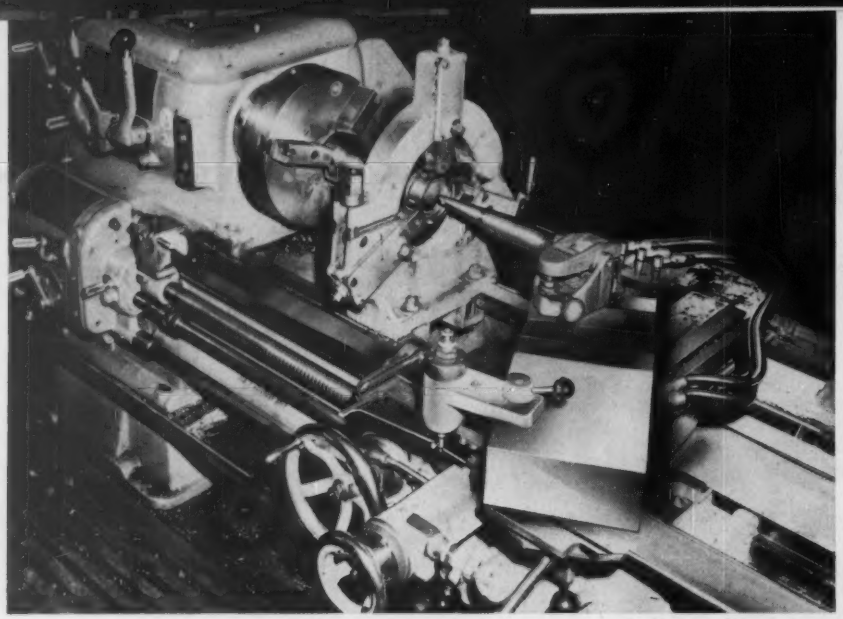


Fig. 3. Machining internal surfaces of the landing-gear strut with a boring-bar mounted on a quick-change type of holder attached to the compound slide of the lathe

surfaces to specified diameters and contours without the necessity of taking any measurements. In Fig. 3, a boring step is in progress, the tool bar being mounted on a quick-change type of holder. With a single movement of the lever on this holder, the tool-block is released. Then a different tool can be conveniently substituted in the block.

Changing a lathe set-up is a matter of minutes. After providing for the desired method of chucking, a suitable template is placed on the template carrier at the front of the machine and positioned approximately for the work at hand. A micrometer adjustment at the end of the carrier facilitates final adjustment of the template longitudinally. In Figs. 2 and 3, a template can clearly be seen on the carriage.

Since only single-point tools are used, the positioning of the tool in the quick-indexing square toolpost provided on the machine in Fig. 2 is a simple matter. In setting up a job, trial cuts are taken in the conventional manner until a desired dimension is obtained on one piece of work. The stylus of the Trace-O-Matic is then adjusted to the template, after which all subsequent contours on the template will be duplicated on the work.

The templates are conveniently made from 3/16-inch flat soft steel, and since only a few ounces of pressure are exerted by the stylus on the template, hardened and ground templates are unnecessary. They may be made simply by rough-sawing from flat steel, and hand-finishing, milling, or shaping. Any errors that may exist in a template can be corrected by hand-filing right at the machine.

The time involved in turning heavy forged-steel machine tool spindles, such as shown in Fig. 4, has been cut in half by employing an Axelson lathe equipped with the Trace-O-Matic attachment, Fig. 5. The floor-to-floor time with this equipment is 64 minutes as against 129 minutes required with the previous practice. The constant checking of diameters, tapers, and shoulders—which is ordinarily necessary on a job of this kind—is unnecessary with the template control. In some places, stock to a depth of 3/4 inch is removed with one pass of the tool even though the forging has a hardness of approximately 180 Brinell. Finishing cuts are held within a tolerance of plus 0.003 inch minus zero of the required size.

In any operation, all cuts are taken with one

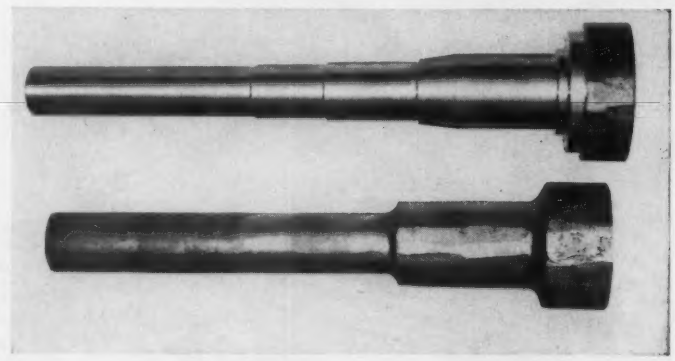


Fig. 4. Forged-steel machine tool spindle, which is roughed and finished on a tracer-controlled lathe in less than half the time formerly required

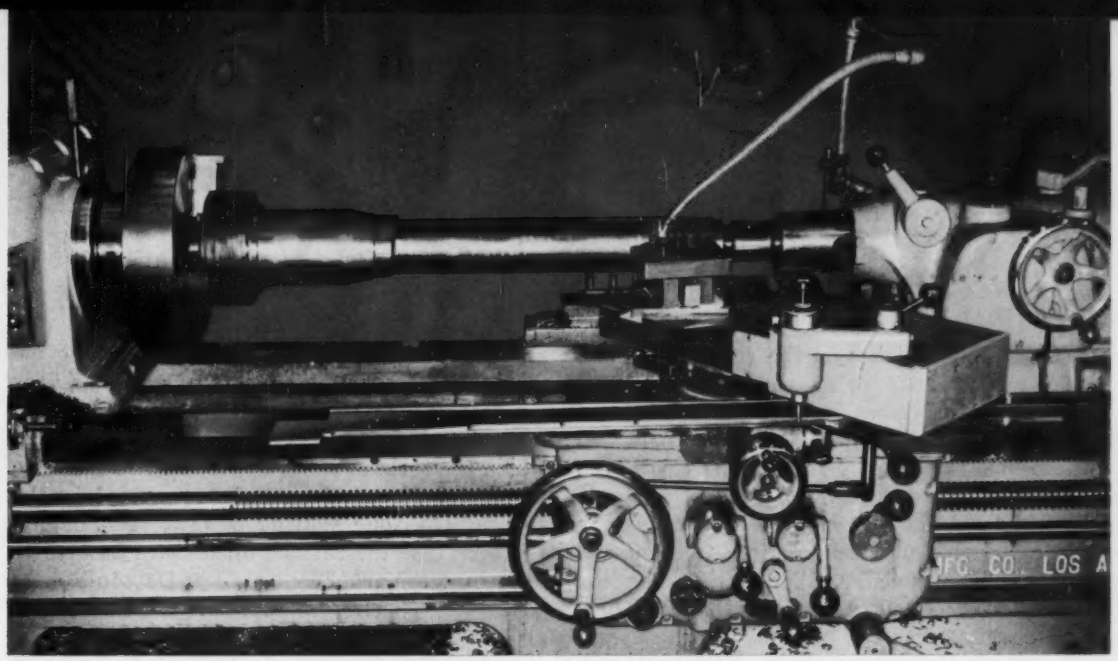


Fig. 5. In all operations performed with the Trace-O-Matic attachment, the angular position of the compound slide with respect to the work surfaces is of considerable importance.

setting of the compound slide, the angle of which is determined by the operator after considering the peculiarities of the particular job. The ideal slide angularity has been attained on any job when the direction of the slide movement bisects the greatest angle between any two adjacent surfaces on the work. In other words, for turning a 90-degree shoulder, the best angle for the tool-slide is 45 degrees in relation to the axis of the work. As a matter of fact, this is the most universal angle used in setting the slide because the greatest amount of work can be handled with this angle.

This condition, however, cannot always exist because contours on the work or sharp tapers may cause either interference or a feed so great as to cause a rough finish. The slide feeds at a standard rate of 45 inches per minute but the actual feed of the cutter depends upon the relationship of the longitudinal feed and the cross-feed. It is desirable to keep the longitudinal feed and the cross-feed equal to each other or only slightly different. The operator could select a compound slide angle that would result in a coarse feed and a rough finish, and then set the slide at an angle that would provide a fine feed and smooth finish. In the case of a 90-degree shoulder, the included angle between work surfaces being machined and the tool-slide axis should not be less than 20 degrees.

The Trace-O-Matic attachment does not interfere with hand operation of the lathe. If desired, the standard compound slide can be replaced within three minutes to permit the lathe to be employed for performing general types of tool-room operations.

New Carbide for Wide Range of Steel-Cutting Applications

A new grade of cemented carbide announced by the Wesson Metal Corporation, Lexington, Ky., has been designed for a wide range of steel machining operations. Called "Grade 26," the carbide is believed to be applicable to 95 per cent of steel-cutting applications. In most of the operations on which the material has been tested during the past year, tool life gains as high as 40 per cent have been recorded. While created primarily to handle rough and semi-finish machining of steel, the carbide is also proving effective on some finishing operations.

Optimum performance for Grade 26 extends over a cutting speed range of from 100 to about 400 surface feet per minute. High red hardness and thermal conductivity have been combined to give good cutting edge strength.

In one application of Grade 26, a 30 per cent increase in tool life is being obtained with a severe interrupted, rough-facing cut on a tractor brake-band anchor. For this operation, a standard Wesson band type Multicut tool is used. Cutting speed ranges from 280 surface feet per minute down to zero, and feed is 0.027 inch per revolution, with a depth of cut of 1/8 inch.

On another facing operation at the same plant, two solid carbide Grade 26 inserts (also mounted in insert type tool-holders) are straddle-facing a tractor final drive-gear. This has resulted in a 40 per cent increase in tool life. The job is being done at 260 surface feet per minute, feed varies from 0.017 to 0.020 inch per revolution, and average depth of cut is 3/16 to 1/4 inch.

Special Machine for Milling Jet-Engine Turbine Vanes

LOCATING notches on the roots of turbine vanes made by one manufacturer of aircraft jet engines were previously milled and then ground to obtain the parallelism, accuracy, and surface finish required. Now, the need for grinding has been eliminated and production has been increased substantially by performing the operation on a special three-station milling machine, Fig. 1, made by the Snyder Tool & Engineering Co., Detroit, Mich.

This machine has two columns on which milling heads are fed vertically on slides by means of hydraulics and air cylinder counterweights. Each head carries a horizontal arbor on which the inserted carbide blade slotting cutters are mounted. The hydraulically operated rotary indexing table, Fig. 2, has three equally spaced fixtures, each holding two vanes.

The vanes which are manually loaded at the first station (seen in the foreground of Fig. 2) are clamped between side-acting jaws. One jaw for each vane has a tapered clamping face and a half-round bearing surface which permits pivoting for angle difference between parts.

When the parts have been indexed to the second station, 0.075 inch of stock is cut from both sides of each vane root in rough-milling the parallel locating notches. Rigidity is essential for the accurate, smooth milling of the tough, heat- and corrosion-resistant, high-nickel alloys from which the turbine vanes are made. In Fig. 3 are illustrated the massive supports provided for the arbors. The four slotting cutters, each having fourteen inserted carbide blades, are accurately located on the arbor by means of Dayton Rogers adjustable spacing collars. After a rapid approach to cutting position, requiring only two seconds, the cutters are fed through the work at the rate of 0.0204 inch per revolution (0.0017 inch per tooth). The cutters are rotated at 153 R.P.M. (a cutting speed of 140 feet per minute).

At the third station, the locating notches are finish-milled by removing 0.015 inch more stock from both sides of each vane root. While a surface finish of 40 micro-inches r.m.s. is required (and was obtained by grinding the notches after milling with the previous method of manufacturing), a finish of 30 to 40 micro-inches is consistently obtained with the present set-up.

When the parts have been returned to the first station, they are unloaded. Loading, clamping, unclamping, and unloading are performed

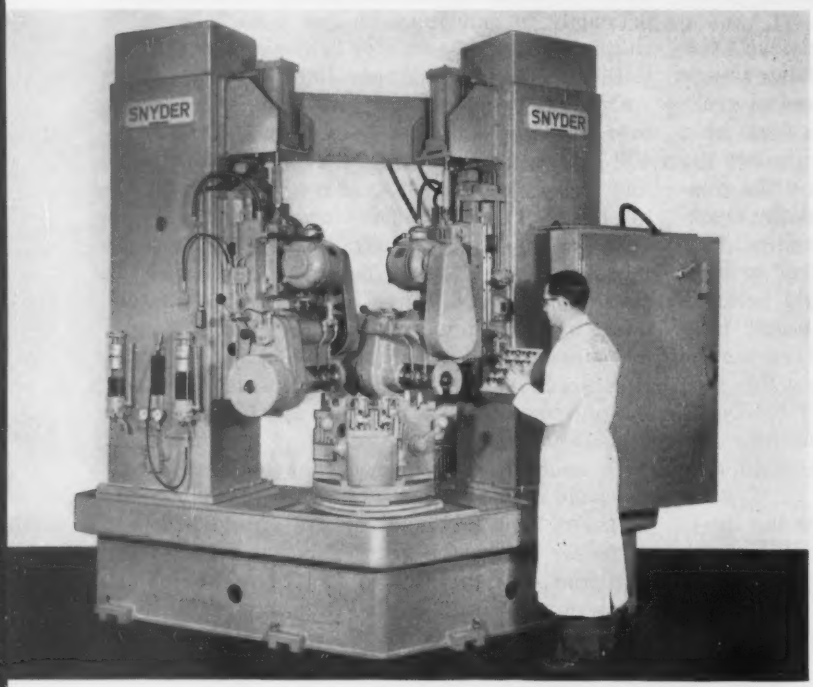


Fig. 1. Special three-station machine for rough- and finish-milling locating notches on the roots of aircraft jet-engine turbine vanes

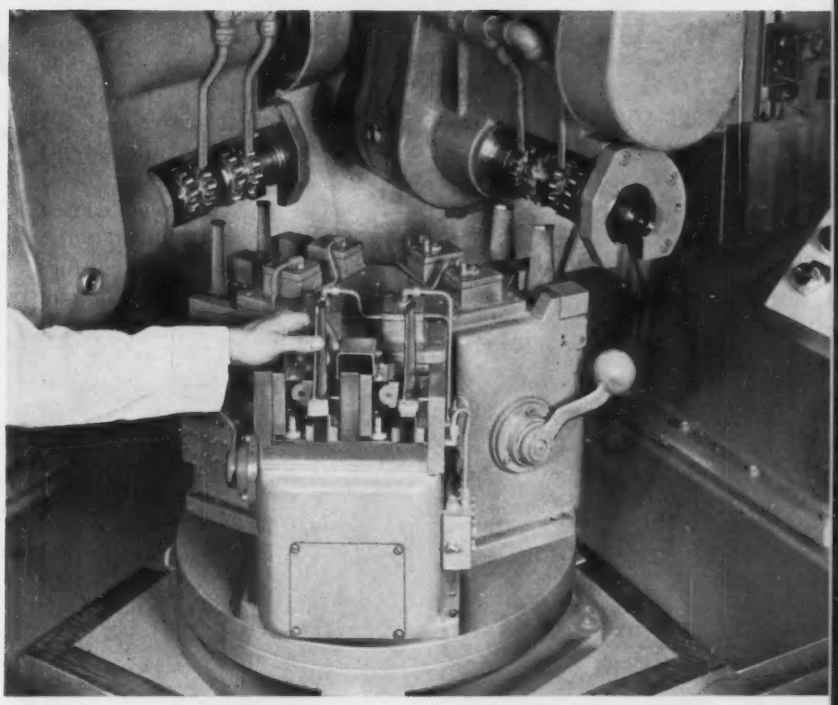


Fig. 2. (Right) Rotary indexing table of milling machine (Fig. 1) carries three work-holding fixtures, each holding two turbine vanes

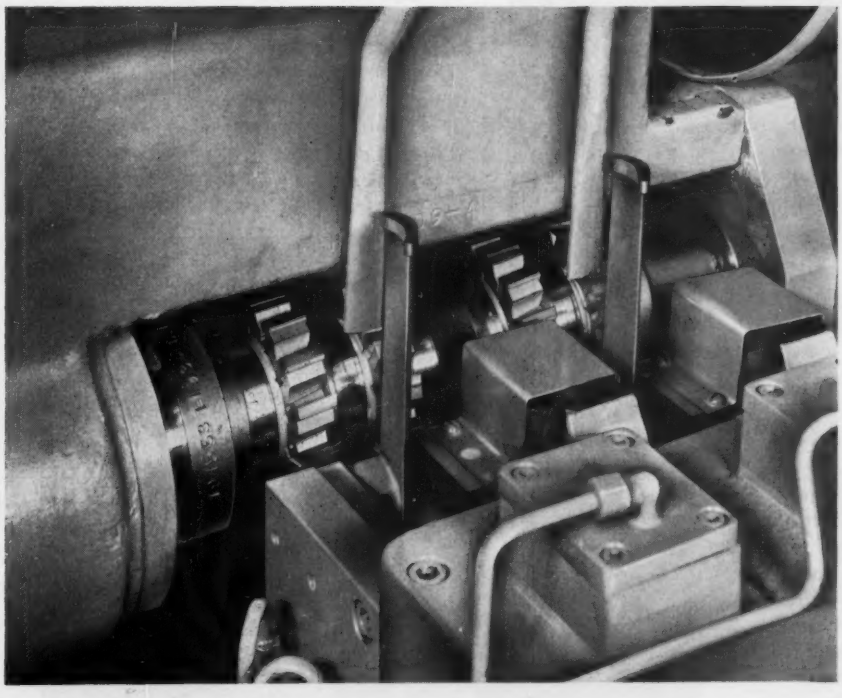


Fig. 3. (Left) Close-up view of one of the milling stations. Each of the four slotting cutters contains fourteen inserted carbide blades

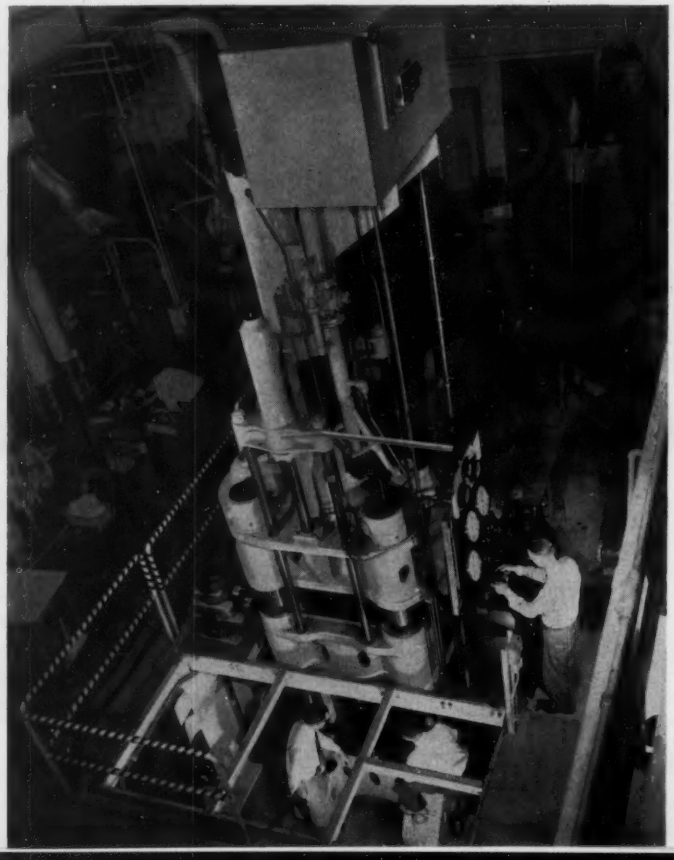
while turbine vanes in the other fixtures are being milled. Rapid approach and return of the cutter-heads requires two seconds each; the feed during milling takes twenty seconds; and indexing, four seconds—which results in a total cycle time of only twenty-eight seconds. Thus, since two parts are completed per cycle, a production of 256 vanes per hour can be obtained.

The milling cutter arbors are held in place by draw-bars and supported by outboard bearings. When the draw-bars are loosened and retracted, necked-down sections on the arbors can be slipped through slots in the under sides of the outboard supports for rapid removal. By having cutters pre-set on spare arbors, quick replacement can be made.

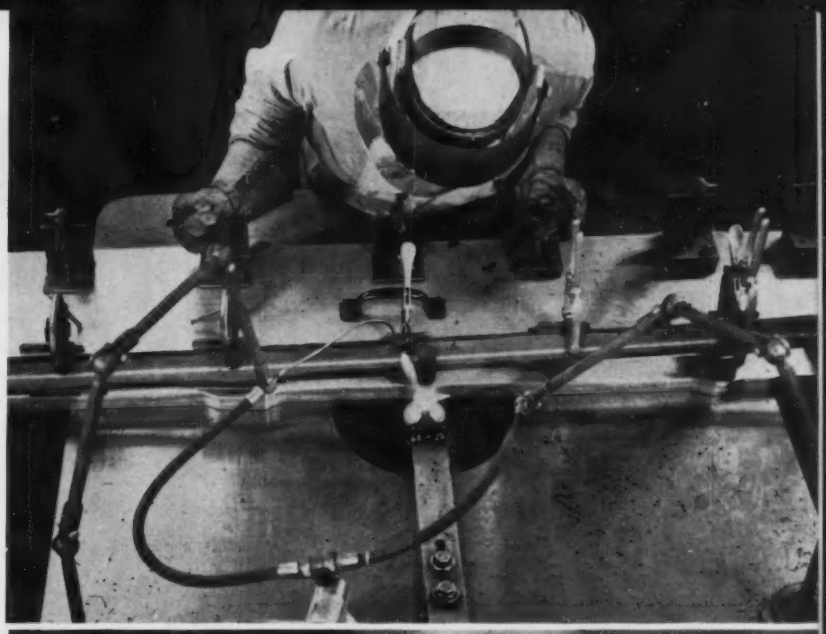
In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

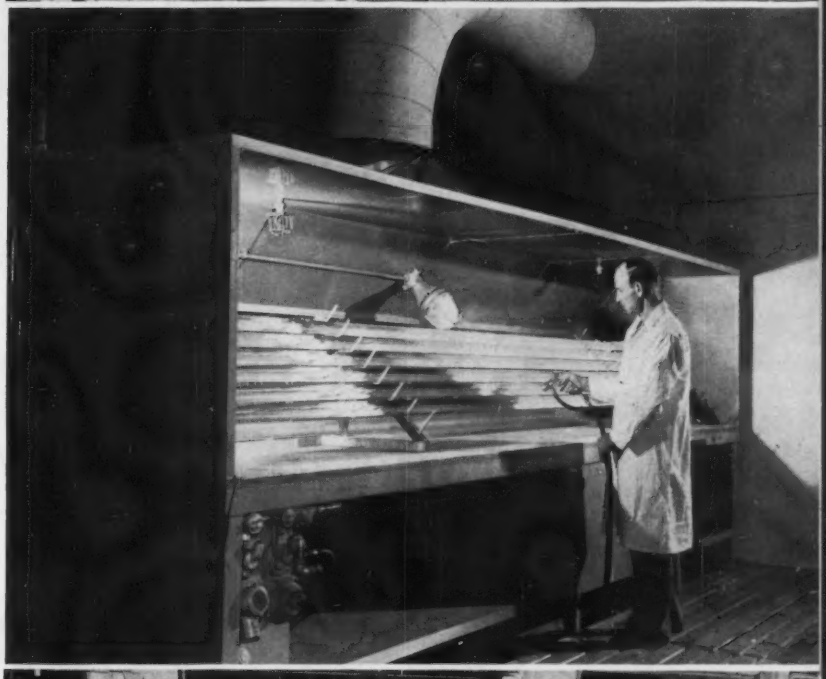
Diatron drill developed by the Curtiss-Wright Corporation, Wood-Ridge, N. J., employs ultrasonic principle to cut intricate holes in metal, ceramic materials, glass, and carbide. The drill tip does not revolve, but reciprocates several thousand times each second, driving a fluid abrasive mixture into the work.



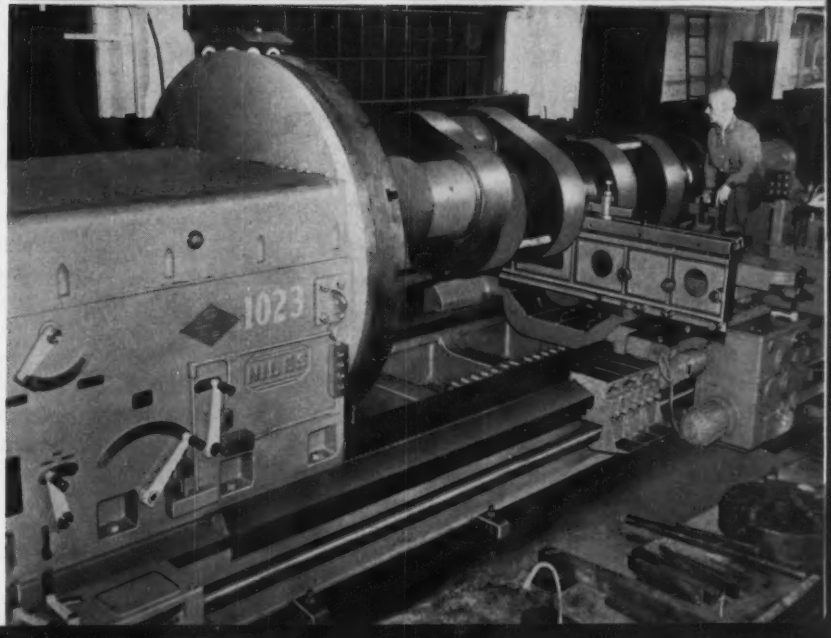
Producing the world's first man-made genuine diamonds at General Electric Research Laboratory, Schenectady, N. Y. In the process, a carbonaceous compound is subjected to extreme pressure and heat for many hours in the Laboratory's new 1000-ton Birdsboro hydraulic press. Largest stone yet obtained measures 1/16 inch in longest dimension.



Profiling steel closure ribs for aircraft on a converted woodworking spindle shaper. Fixture holding work has the required contour and rides against bushing mounted on shank of cutter, a three-fluted Kennametal end-mill. Two machines, in line, rough and finish ribs, the roughing cutter having a bushing 1/8 inch over size in diameter.



Spraying dye-mark developer on aircraft parts undergoing inspection by the Dy-Chek process at Northrop Aircraft, Inc., Hawthorne, Calif. Previously, the parts were dipped in dye penetrant fluid, dye remover, and wash tanks, then dried in oven. The developer discloses flaws as a red "bleed" against sprayed white background.



Machining a large marine Diesel engine crankshaft on a 90-inch Niles lathe at the Maryland Drydock Co., Baltimore, Md. With the tool mounted on a special cross-feeding bar, the operator can machine the close confines of main journals, with only two settings.

Gear Grinding Set-Ups Made in Sixty Minutes

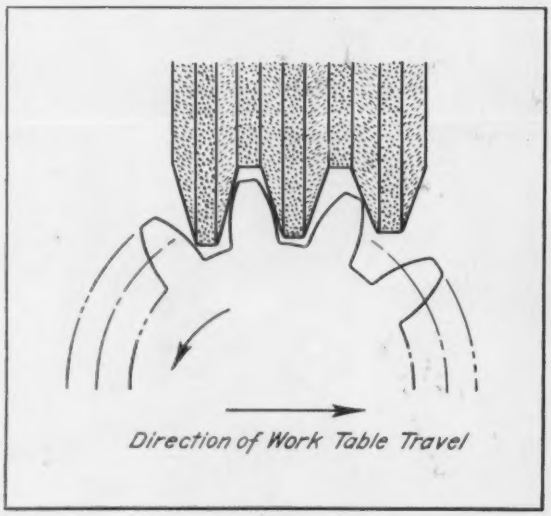


Fig. 1. To generate the involute form, the gear both rolls and advances beneath the path of the wheel, which reciprocates as it revolves.

A DRASTIC slash in set-up time and in tooling expense required in a new type grinding machine makes small-lot orders of precision spur and helical gears profitable. To set up the equipment, it is only necessary to rotate a dial to an index number corresponding to the required involute shape, replace three change gears according to number of teeth required, and—if the diametral pitch is different from that in the previous set-up—insert another wheel-dressing cam. A complete set-up takes only sixty minutes.

The machine has a number of novel features that eliminate large inventories of special tooling with limited use. The heading illustration shows the grinder with its control console at the left. Of the generating type, the grinder handles gears of 4 to 48 pitch. The range of pitch diameters accommodated is from 3/4 to 7 1/2 inches. Developer and builder of the machine is Belock Instrument Corporation, College Point, N. Y.

The relative movements of the grinding wheel and work are shown in Fig. 1. The tooth form is generated by a single grinding wheel reciprocating in a horizontal plane for a distance pre-set according to the width of the gear face. Around its periphery, the wheel has three annular rack forms; the pitch diameter of each is stepped up progressively so that in each pass three adjacent teeth are roughed, semi-finished, and finished. The gear to be ground is on an arbor, supported between centers mounted on a work-table which feeds across the path of the reciprocating wheel.

During each pass, the table feeds and the work rotates a predetermined number of degrees of arc under the basic rack form of the wheel periphery. This "roll-to-advance" ratio is obtained by adjusting the involute dial vernier, seen in Fig. 2, on the right side of the machine. Modifications of the involute can be produced by minor correction of the absolute setting.

For grinding spur gears, the wheel-spindle slide is fixed parellel to the axis of the work-table centers. For helical gears, the slide is offset to the proper helix angle, to a maximum of 35 degrees. Since the root fillets are ground as a continuous part of the involute flank, stress-concentration failures are minimized.

An integral hydraulic system produces the movements of the wheel-slide and work-table. In the console are grouped controls for the hydraulic and lubricant pump motors, wheel-dressing interval cycle, and work completion counter; and push-buttons for wheel-spindle power and dynamic braking. If convenient, the console can be located remotely, since it requires no further attention after the initial adjustments have been made. All direct operating controls such as grind, dwell, and emergency-stop push-buttons; and dress, operate, and work-complete telltale lights, are arranged in a panel on the machine itself.

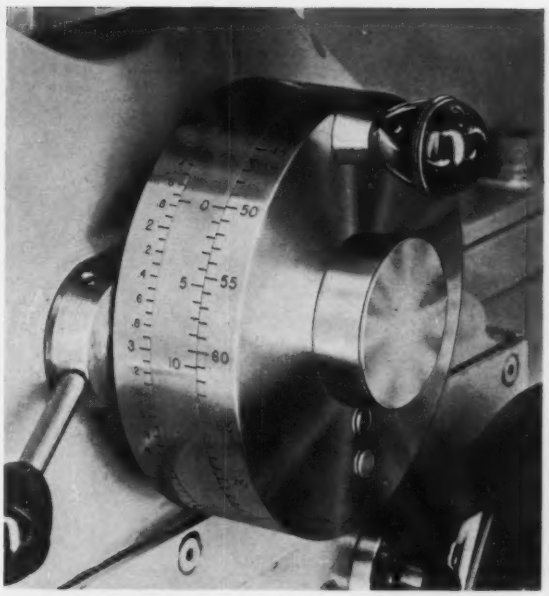


Fig. 2. A feature of the grinder is the dial vernier by which the "roll-to-advance" ratio is quickly set to a number determined by a simple equation

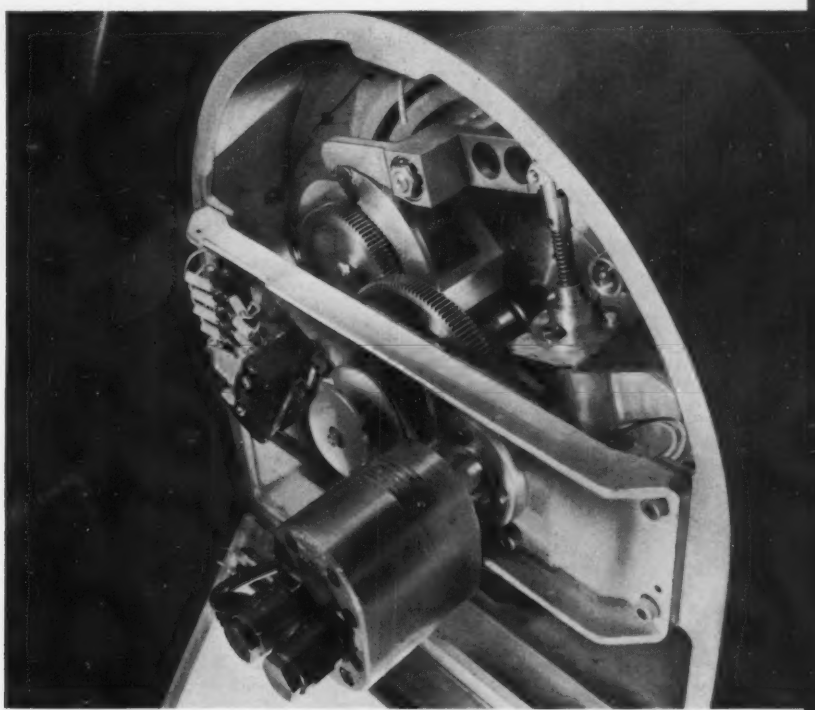


Fig. 3. The change-gears rotate in a 10 to 1 ratio with the work-spindle to give a high degree of indexing accuracy

Fig. 4. To save machine time and diamond wear, new wheels are crushed to the approximate involute form

The gear-box of the grinding machine is shown in Fig. 3. Any of 1214 combinations of tooth pitch and pitch diameter is obtainable with a set of fourteen cams and seventy-two change-gears. In contrast, regular form-gear grinders require a separate cam for each tooth-pitch and pitch-diameter combination. The economies provided by the new machine are most apparent in small-lot grinding. By controlling an indexing clutch with a multiple selector switch, it is possible to use a large change-gear ratio to assure a high degree of indexing accuracy.

Before a new grinding wheel is positioned on the machine spindle, its periphery is crushed to the approximate rack form on auxiliary equipment, as shown in Fig. 4. In this practice, a tool-steel master roll is rotated by power and forced into the wheel, which is supported so that it is free to turn. A preliminary dressing by this means saves valuable machine time and prolongs the life of the diamond used for finish-dressing. Following crushing, the wheel and its spindle adapter are carefully balanced.

The finish-dressing of the crushed wheel and subsequent dressings during use are performed with a Hoglund contour wheel dresser designed in the machine. Actuated from the hydraulic system of the grinder under the direction of a four-way metering valve, the dresser uses expanded cams in the form of inclined planes to obtain the required precision profile.

The design of the dresser can be understood from Figs. 5 and 6. In Fig. 5 is shown the under side of the device, with the bottom plate removed; views X and Y, Fig. 6, are side and end sections, respectively, and view Z a projection of the under side.

The dresser is actuated by a hydraulic cylinder

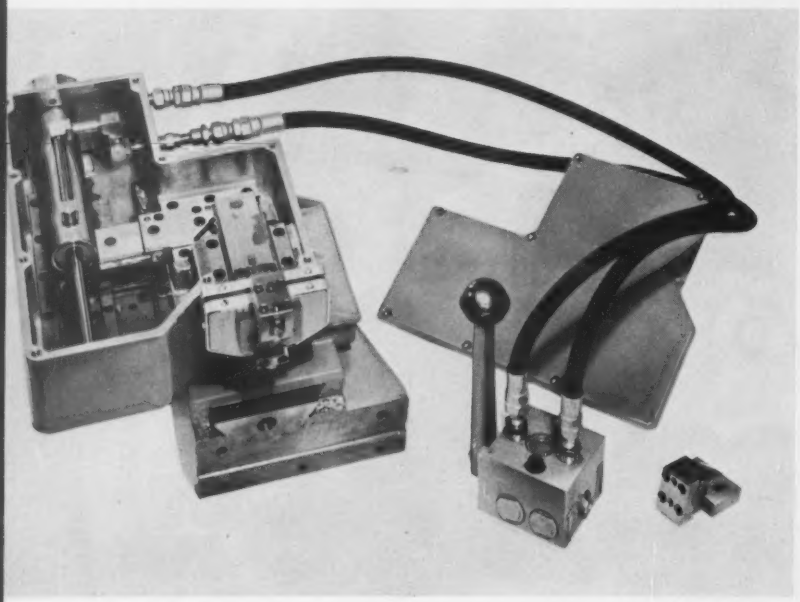


Fig. 5. View of the bottom of the wheel dresser, showing the arrangement of the hydraulic cylinder and slides

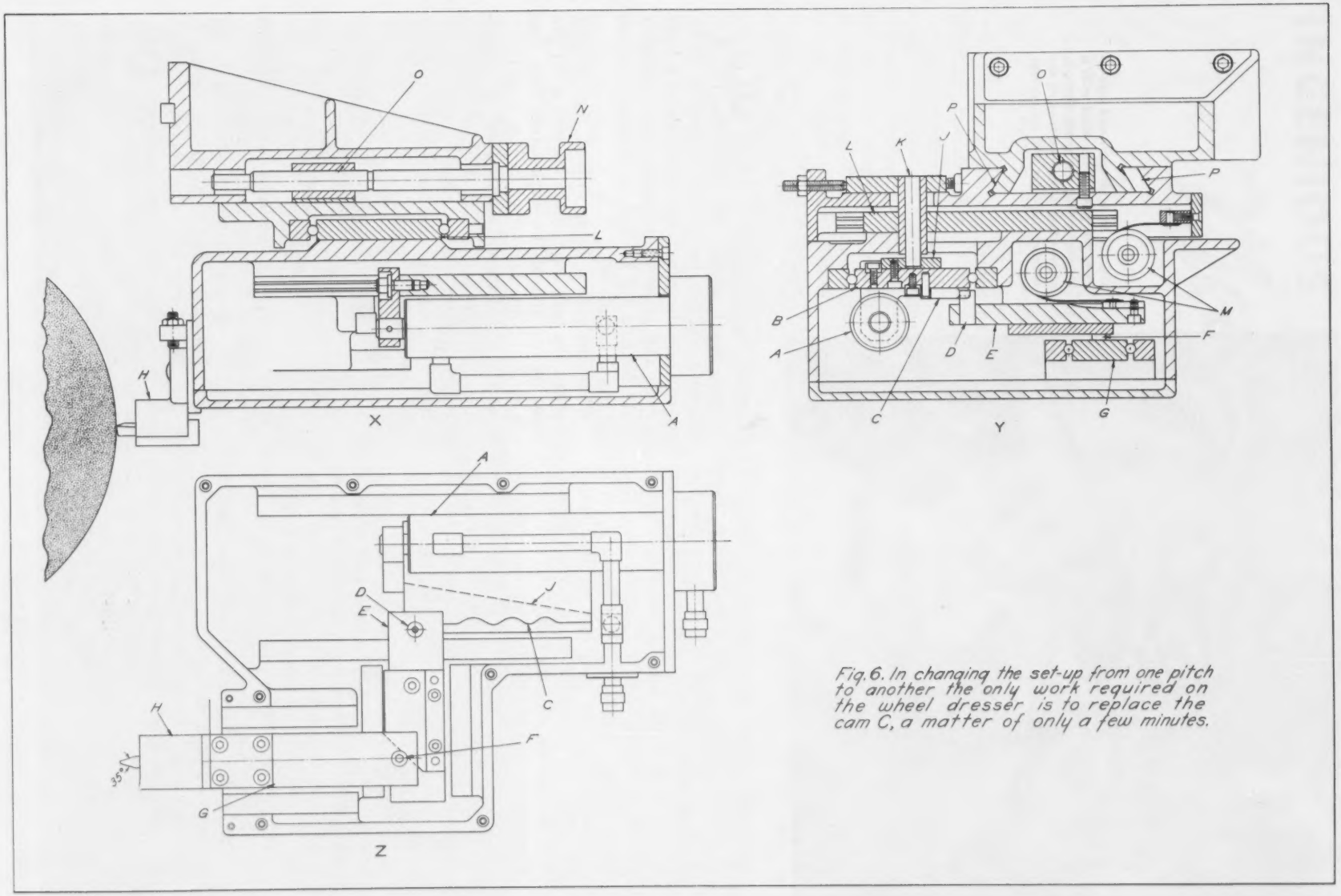


Fig. 6. In changing the set-up from one pitch to another the only work required on the wheel dresser is to replace the cam C, a matter of only a few minutes.

Fig. 7. In a preparatory operation, the gear is provided with a driving collar on bench centers, eliminating any down time of the grinder itself for this adjustment

A controlled through a four-way metering valve. This cylinder moves a slide *B* carrying a wheel contour cam *C*. Follower pin *D* moves intermediate slide *E*, and in turn, follower pin *F* moves slide *G* to control the depth of the movement of the dressing diamond holder *H*. At the same time, inclined plane *J* bears against stationary pin *K* and imparts, through slide *L*, a reduced transverse motion to the holder, in an inverse proportion to the expansion of the cam.

Negator springs *M* urge the follower pins into contact with their respective slides. Depth of dress is controlled through a graduated knob *N* on the end of a lead-screw *O*. By this means, the dresser is moved on ways *P* into engagement with the grinding wheel.

The cam *C* is a reversal of the contour required in the grinding wheel. It has a 5 to 1 ratio of the contour parallel to the wheel axis, and a 1 to 1 ratio relative to the actual contour of the wheel. By using two different ratios in two coordinates, steep profiles can be climbed, which otherwise would not be possible. The roots of the cam are profiled to produce the desired fillet on the gear to be ground.

Once the length of the interval of wheel efficiency between dressings has been determined from experience, the grinding cycle is automatically and periodically interrupted so that the wheel can be dressed. Control of this action is set at the console. Upon completing the pass in progress, the wheel-slide shuttles to the right, bringing the wheel into dressing position. Simultaneously, the appropriate telltale light on the grinder panel signals the operator. He then adjusts a dial for the amount of stock to be removed from the wheel, and manipulates a lever to start the dressing operation. Approximately thirty seconds are all that is required to dress the wheel completely.

While one gear is being ground, the operator provides the next gear in the lot with a driving collar on one end of the work-arbor. This step can be seen being performed in Fig. 7 on bench centers supplied with the equipment. The illustration also shows the stand used for balancing, and a comparator microscope for setting a new diamond in its holder in proper phase with the cams in the dresser.

* * *

Versatile Nickel

A half century ago the important applications for nickel were relatively limited. Today, its versatility has become well-known throughout the industrial world. Nickel is an important alloying element for steels—particularly stainless steels. It vastly improves the property of cast-iron, and it is alloyed with chromium, iron, copper, aluminum, and other elements to give special properties for mechanical, chemical, electrical, magnetic, and other purposes. It is also employed in large quantities for plating many different materials.

INGENIOUS *Mechanisms*

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanism for Actuating Cut-Off Device

By WALTER HOMMEL, Phoenix, Ariz.

On a machine designed for the manufacture of artificial greenery, such as that used for ornamental purposes in the display cases of butcher shops, a mechanism was required that would trigger a cut-off slide yielding strips of desired lengths. The machine produced a continuous strip consisting of an aluminum clip and several layers of green synthetic rubber. It was necessary to cut this strip into lengths of 18, 21, 24, 27, and 30 inches as needed.

The unit shown in Fig. 1 successfully fulfilled this purpose. Only the components comprising the actuating mechanism are shown; all linkages to the basic machine are eliminated for clarity. Power to drive this mechanism is derived from the machine through shaft *A*. The shaft turns in the direction of the arrow, and is geared to make twelve revolutions for each 18-inch length of strip material that is produced.

A single-thread left-hand worm *B* is free to slide on this shaft, although keyed to it. Sleeve *C* is keyed to the shaft in the same way. The roller end of bellcrank *D* rides in an annular groove in the sleeve. Both the sleeve and the worm are held against stop-sleeve *E* by coil spring F_1.

A straight-toothed clutch consisting of members *G* and *H* is mounted on a larger diameter step of shaft *A*. Driven clutch member *G*, which is free to rotate on the shaft, has gear teeth cut around its periphery. These teeth mesh with a gear on the cut-off slide of the machine, which is not shown. Any rotation of the driven clutch member *G* will cause the cut-off slide to complete a cycle.

Driving clutch member *H* is keyed to shaft *A*, but is free to slide in and out of engagement with its mating part. A groove is cut around the outside diameter to receive the rollers from a yoke *J*. The left-hand end of this driving clutch member butts up against the right-hand end of sleeve *C*. The remaining parts of the mechanism have but one purpose, to cause member *H* to momentarily engage member *G* after the pre-set length

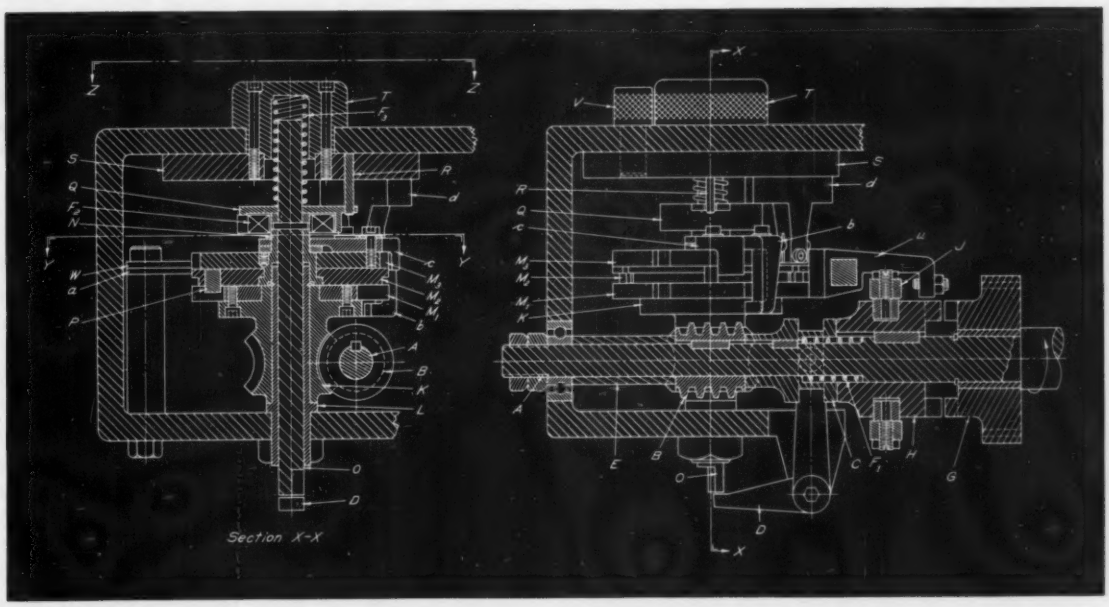


Fig. 1. Mechanism which controls the cut-off length of strip material being fed from a fabricating machine.

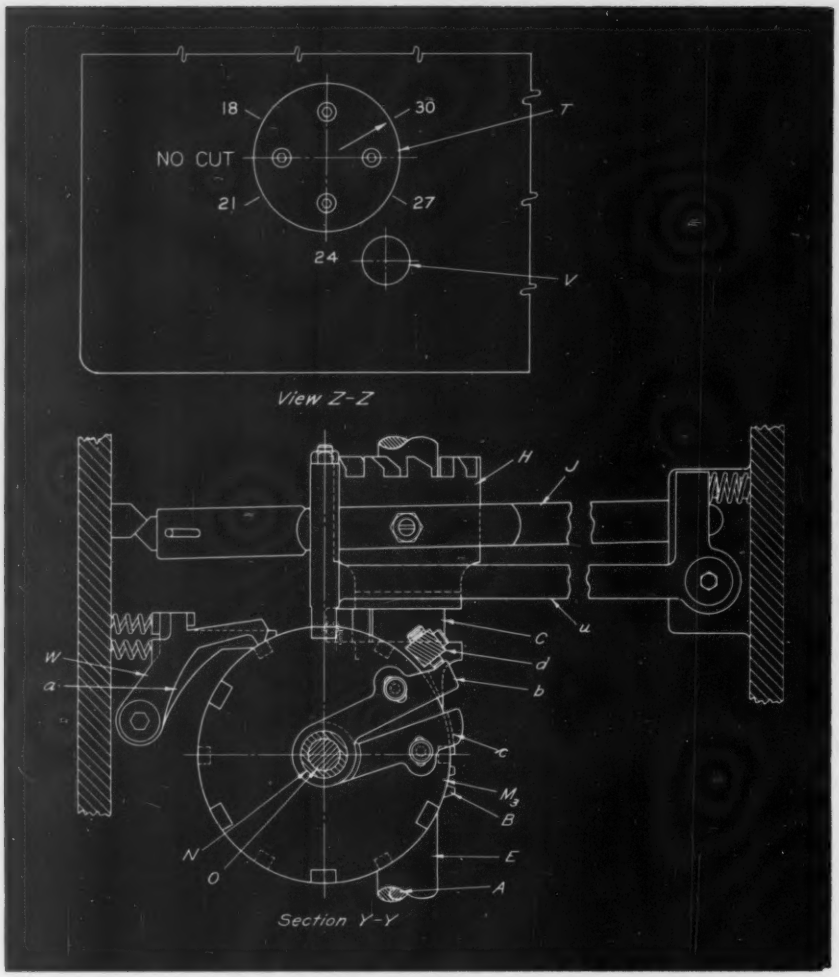


Fig. 2. Length of cut-off piece is selected by means of a knob (T). A register-pin (V) secures the selector knob at the desired setting.

of strip material has been fed from the machine.

Flanged worm-gear *K*, which has twelve teeth, is mounted on hollow shaft *L* as seen in section X-X. A snap-ring retains the gear in position on this stationary shaft. Above the worm-gear are three discs, each having six equally spaced notches along their outer edge.

Disc M_1 is fastened to the flange of the worm-gear, thus rotating with it at all times. Disc M_2 has a stepped flange and a counterbored shaft-hole. The base of the counterbore rests on the flange of stepped bushing *N* which is pinned to shaft *O*. Drive-pin *P*, a press fit in disc M_2, passes freely into one of the notches of disc M_1 which causes the two discs to rotate together when in the position shown in Fig. 1. Disc M_3 is secured to stepped bushing *N* by a set-screw passing halfway into both the disc and the bushing.

One end of spiral spring F_2 is also secured to the bushing. The other end of the spring is fastened to cage *Q*. An arm extending from the cage engages a pin *R* that is pressed into disc *S*. This disc is bolted to selector knob *T*.

The cut-off is effected when notches in all three discs line up with latch *U*, section Y-Y, Fig. 2. Only one notch in disc M_2 is wide enough to accommodate the latch, the remaining five notches are just wide enough to receive pawl *W*. When the wide notch in disc M_2 lines up with a notch in each of the other two discs, the latch snaps into place locking all three discs. This, of course, prevents worm-gear *K* from rotating.

Since the worm-gear cannot turn, worm *B* is forced to slide to the right along shaft *A*. The sliding worm pushes sleeve *C* along with it which, in turn, forces driving clutch member *H* into engagement with driven clutch member *G*. At this moment a cut-off takes place. As member *H* is moved to the right, yoke *J* strikes a contact screw on latch *U*, forcing the latch out of engagement with the three discs and allowing the worm-gear to rotate freely once again.

This is the general principle of the mechanism without taking into account the selection of a desired cut-off length, or the number of revolutions shaft *A* should make before the latch is permitted to engage the three discs. As stated previously, shaft *A* is geared to make twelve revolutions for each 18 inches of strip material that is fed from the machine. Therefore, as worm-gear *K* has twelve teeth, it will make one complete revolution for each 18 inches of strip produced. If discs M_1 and M_2 rotate together while disc M_3 remains stationary, the three notches will line up, permitting the latch to engage them, once during each revolution of the worm-wheel. This

is the case when selector knob T is locked at the 18-inch setting by register-pin V, view Z-Z, Fig. 2.

For longer cut-off lengths the engagement of the latch must be delayed. The machine must be allowed to feed out a greater length of strip material before the cut-off slide is actuated. The notches provide control over this. Since one revolution of the discs represents an 18-inch feed of the machine, and since disc M_2 has only one notch wide enough to receive the latch, then the shortest length of material that can be produced is 18 inches. Therefore, each of the six notches represents 3 inches of feed. For each one-sixth of a revolution added to worm-gear K, 3 inches will be added to the cut-off length.

The unit, as shown, is set to provide a cut-off length of 30 inches. Assuming that all three discs are lined up, and that the latch has dropped into place halting rotation of the worm-wheel, then worm B will move sleeve C and clutch-member H to the right causing a cut-off to take place. Simultaneously, bellcrank D pivots thereby elevating shaft O, stepped bushing N, discs M_2 and M_3, and spiral spring F_2.

As these units are raised, locking pawl W engages a notch in disc M_2, preventing it from turning. At the same time, holding pawl a slides under the flange of disc M_2, thereby retaining the two discs in the elevated position after the bellcrank has returned to its original position under the influence of spring F_1. Also, dog b, secured to the upper surface of disc M_3, engages a notch in disc M_1 to form a positive drive between them.

After yoke J has disengaged latch U from the discs, worm gear K is once again free to turn. Clutch-member H is moved out of contact with its mating half by a lever arrangement on the cut-off slide (not shown), As the worm-gear and disc M_1 resume rotation, disc M_3 is forced to follow because of dog b. Disc M_2 is locked 1 or 2 degrees off position so that the latch cannot line up with the one wide notch until the disc has made one complete revolution.

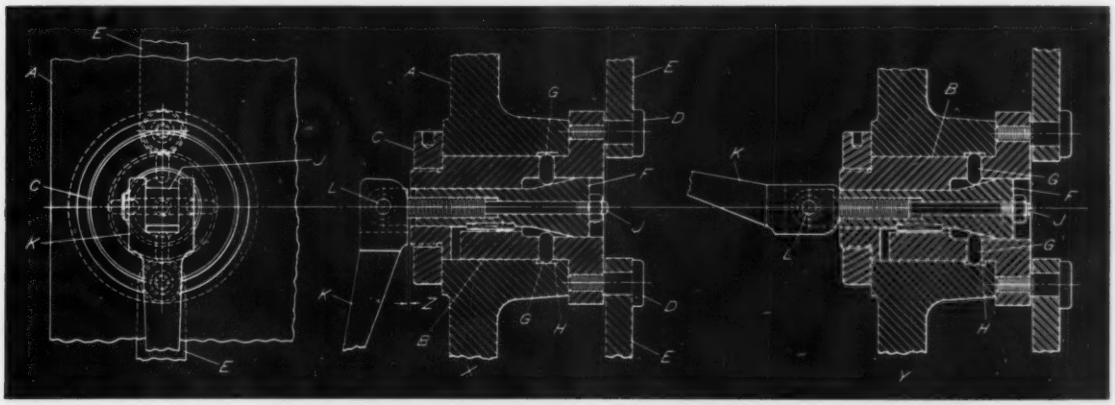
When the upper and lower discs have completed four-sixths of a revolution together, during which time 12 inches of strip material have been fed out of the machine, a second dog c contacts the two pawls W and a, causing them to release disc M_2. Upon release, discs M_2 and M_3, together with spiral spring F_2, drop to their original positions (Fig. 1) aided by spring F_3. Now that dog b is no longer interlocked with disc M_1, spiral spring F_2 returns disc M_3 to its starting point against adjustable stop d. The unit now makes one more revolution until the wide notch in M_2 lines up with latch U allowing it to fall into place. A cut-off is now effected. During this final revolution, prior to the cut-off, an additional 18 inches of strip material has been fed out, bringing the total length to 30 inches.

Selection of the length to be cut off is made by raising register-pin V, setting knob T to the appropriate position, then lowering the register-pin to lock the setting. When set for a length of 18 inches, the flat, machined on the lower end of shaft O, is aligned with the contact end of the bellcrank so that the shaft is not raised. At the "no cut" setting of the selector knob, disc M_3 is held in an intermediate position so that latch U cannot enter at any time.

Variable Stroke and Quick-Action Lock for Reciprocating Slides

By W. M. HALLIDAY, Southport, England

On an inspection unit of a recording type it was required that two light-weight slides be moved simultaneously over equal distances, but in opposite directions. Each slide was equipped



Manually operated mechanism provides stroke adjustment and rapid locking for two opposed reciprocating slides.

with a sensitive electrical device having a plunger for making contact with the sides of a stationary work-piece under test. When brought into contact position, the slides had to be instantly locked to maintain the setting. To insure the necessary sensitivity of movement for the two slides, their motion was transmitted through a specially designed hand-operated mechanism shown in the accompanying illustration.

The cross-section at X shows the construction of this manual drive mechanism and the positions occupied by working members when in the unlocked position. A section of the vertical machine wall *A*, on which an integral boss is located, is bored to receive flanged sleeve *B*. The portion of the sleeve extending beyond the machine wall is reduced in diameter and threaded for circular lock-nut *C*, which holds the sleeve in place and may be adjusted by means of a spanner wrench.

Two shoulder-studs *D* are screwed into the sleeve flange at points diametrically opposite each other and equally distant from the longitudinal center line of the device. Pivoting about each of the two studs is a link *E*. Each link is identical. The opposite end of each link (not shown) is connected to a machine-slide to be reciprocated.

Sliding within a hole bored through sleeve *B* is cylindrical plug *F* which is keyed in place to prevent independent rotation, but still allowing endwise movement. The plug has a conical head which rides within a counterbore in the flanged end of the sleeve. The largest diameter of this head is ground with parallel sides for a short distance to provide a close sliding fit within the counterbore. This lends additional support to the head and helps to maintain its accurate alignment during locking movements. The surface of the conical head, which is formed at an angle of 10 to 12 degrees from the horizontal, should be hardened and polished smooth.

Four equally spaced holes are drilled radially through the side walls of sleeve *B* into the counterbore. These holes are the same diameter and are located in the same plane. Sliding freely within each hole is a pin *G*, both ends of which are rounded. All four pins must be accurately machined to the same over-all length and hardened.

The inner ends of the pins bear against the conical head of the plug while the outer ends extend into a shallow annular groove *H* which is machined concentrically in the bored hole in machine wall *A*. The width of this groove is slightly greater than the diameter of the pins, and the depth need be only about 1/16 inch. The purpose of this groove is to prevent scoring the surface of the bore in contact with sleeve *B*.

A clevis-pin *J* is threaded into the center of plug *F*, fine-pitch threads are cut on the larger pin diameter at the clevis end. A standard hexagon nut is screwed on the opposite (right-hand) end of the clevis-pin to lock it in position. This arrangement permits both radial and endwise adjustment of the clevis-pin.

Operating lever *K* has a forked end for fitting over the end of pin *J*. The width of the lever end is almost the same as the smaller diameter of sleeve *B*. A cam-like curvature is formed on the upper right-hand corner of the lever as shown at X in the illustration. The cam radius increases gradually as the curve approaches the top surface of the fork. The thickness of the forked end of the lever, together with the location of pivot-pin *L*, are carefully determined so that a clearance *Z* of about 0.025 inch will be provided.

To lock sleeve *B* within its bearing hole, lever *K* is simply pivoted upward as shown at Y. This action causes plug *F* to be drawn to the left. The conical head of *F* contacts pins *G* forcing them outward and into annular groove *H*. Sleeve *B* is thus locked within the bearing hole in wall *A*, and further movement cannot be transmitted to the two links *E*.

To operate the machine-slides, lever *K* is depressed to the vertical position, thereby releasing the locking pressure. The lever, clevis, plug, and sleeve members can then be rotated in unison to impart the desired motion to the machine-slides.

* * *

High-Strength Gears Made From Powdered Alloy Steel

The application of powder metallurgy to the production of high-strength gears requiring the properties of solid alloy steel has been jointly announced by the Vanadium-Alloys Steel Co., Latrobe, Pa., the Keystone Carbon Co., St. Marys, Pa., and the Hydreco Division of the New York Air Brake Co., Cleveland, Ohio. The Vanadium-Alloys Steel Co. developed 4650 steel powder, a pre-alloyed type made by water disintegration of molten metal. Fabrication of this powder into gears with a tensile strength exceeding 100,000 pounds per square inch and with high wear resistance properties has been carried out by the Keystone Carbon Co. Gears have been made with pitch diameters of 1 1/2 inches and in various lengths from 1/4 inch to 1 1/2 inches. The Hydreco Division has adapted these gears to its line of hydraulic pump equipment after field tests and accelerated life tests which have been conducted for two years to determine the performance characteristics of the powdered steel gears relative to the known performance of the cut steel gears formerly used.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Production Rack-Cutting on Horizontal Milling Machine

By H. J. GERBER, Stillwater, Okla.

Although it is possible to cut racks on a milling machine by the use of a rack-cutting attachment and a single-tooth form cutter, this method is inadequate if more than a few units are required. The set-up shown in the accompanying illustrations is designed to facilitate the production milling of racks, 1 foot in length, on a horizontal milling machine.

The only item of tooling that requires any considerable investment is a multiple-tooth annular cutter *A*, Fig. 1. It is a one-piece unit, 6 inches wide. Because of its width it can cut the 12-inch row of teeth in two passes. A simple plate type fixture *B*, which is made to hold a number of steel rack blanks, is bolted to the milling machine table *C*.

The principal difficulty in this type of operation is repositioning the rack for cutting teeth on the second half of the blanks. However, this problem has been handled in the following simple manner.

Bracket *D* is screwed to the outer end of the machine knee to support dial indicator *E*. A hardened and ground stop-block *F* is screwed to the outer face of the machine saddle. The purpose of this stop-block is to assure accurate contact with the indicator point and also with a 6-inch gage-block *G*.

Prior to making the first pass, the saddle *H* is moved toward the machine head a sufficient amount to permit gage-block *G* to be placed between the stop-block and the indicator contact point. The indicator is then set to zero and the cut taken, as shown in Fig. 2. Only one pass is necessary across each half of the rack blanks as the machine is set to cut the full depth of tooth.

When this cut is completed, the saddle is backed off slightly and the gage-block removed. The saddle is then moved outward until the indicator arm contacts stop-block *F*, and the needle is once again at zero. In this position the cutter and work-pieces are accurately aligned for the second and final pass which completes the job.

While this set-up involved only two passes, there is no reason why longer racks requiring additional passes of the cutter could not be accommodated. The only alteration in the tooling would be to provide additional gage-blocks of the proper lengths. Total length of the racks would, of course, be limited by the extent of the saddle movement.

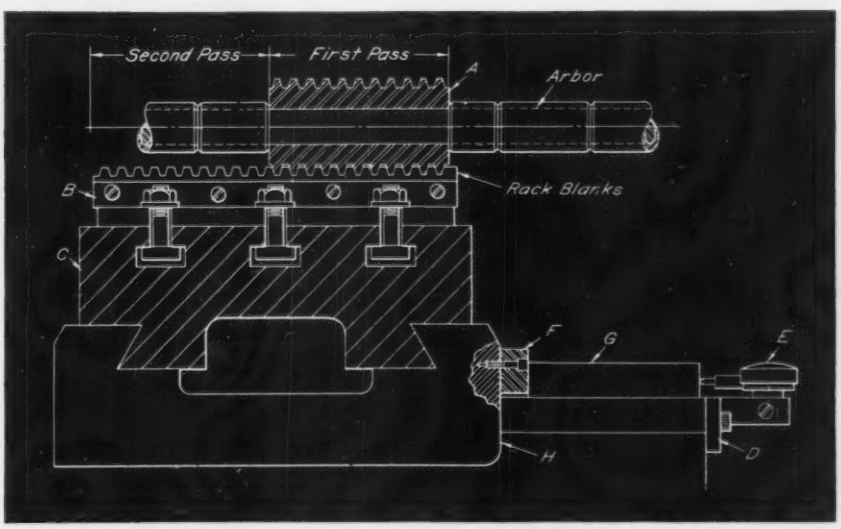


Fig. 1. Special indexing arrangement, together with multiple-tooth annular cutter and simple fixture, permits the production milling of teeth on long racks.

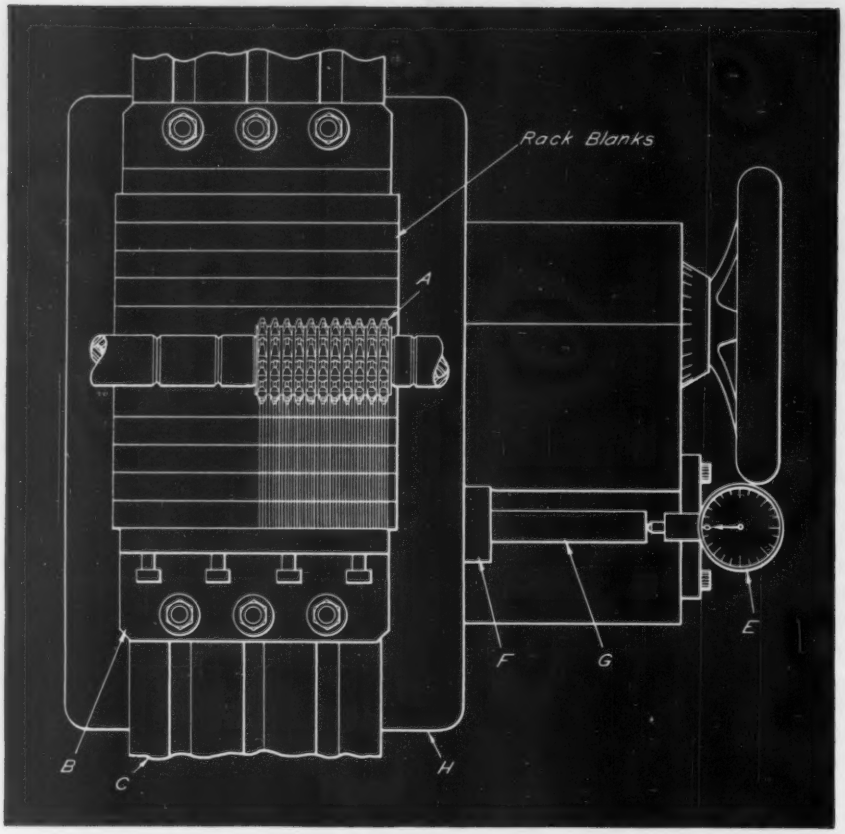


Fig. 2. A group of 12-inch long racks are cut in two passes with a 6-inch wide cutter. Spacer (G) is removed for the second pass.

Instead of using the solid cutter mentioned, it is possible to use a gang of single-tooth form cutters provided with appropriate spacers between them. This arrangement would probably be less expensive. It would, on the other hand, be less convenient to handle and certainly not as foolproof.

Vise Fixture Grips Screw-Heads

By WILLIAM MORSON, Birkdale, England

Standard machine screws are frequently altered to suit special applications. When the screw happens to be of the hexagon- or square-head type, it may be readily gripped across the flats in a vise. If, however, the screw has either a flat-head or a fillister-head, then gripping it between vise jaws is impractical.

A simple fixture designed for holding flat-head and fillister-head screws is shown in the accompanying illustration. Although it is intended to be used in conjunction with a conventional vise, the gripping action of the vise jaws is not utilized for clamping the screw in place.

Two pairs of parallel steps are machined on the long sides of steel body block *A*. Steps *B* are the surfaces to be gripped by the vise jaws, while the second pair of steps are merely for clearance purposes. The ledges formed by steps *B* prevent the fixture from tilting in the vise.

A centrally located T-slot *C* extends along the bottom of the block. The ends of the block are recessed to receive plates *D*. The purpose of these plates is to close off the T-slot which has fitted within it a steel T-shaped slide *E*.

Two holes of different sizes are drilled and tapped through slide *E*. In this case the larger hole is 7/16 inch diameter to accommodate lock-screw *F*, and the smaller hole is 1/4 inch diameter for a similar lock-screw (not shown). Only one lock-screw is employed at any one time, the choice depending upon the size of the screw to be held. On the tip of each lock-screw a tang is formed to fit a screwdriver slot. This provides positive locking of the work.

A V-shaped slot *G* is machined through the upper left-hand portion of the body block. The sides of the slot have an included angle of 82 degrees to correspond with the head angle of a standard flat-head screw. The slot is also tapered lengthwise with the widest portion located at the left. At this widest point, the slot will accommodate a 5/8 inch diameter screw, while at its opposite end, it will accommodate a 1/4 inch

diameter screw. This lengthwise taper may be varied to suit the range of screw sizes to be handled by the fixture.

A T-slot *H* is machined through the upper right-hand portion of the body block. This slot is also tapered uniformly along its length and will accept fillister-head or similar type screws ranging from 3/16 inch to 9/16 inch shank diameters. The depth of the slot is slightly greater than the height of the largest screw-head to be handled. Slots designed with different tapers may be used instead of those shown, to accommodate various ranges of screw sizes.

The thin metal wall remaining between T-slot *C* and tapered slots *G* and *H* is machined through in two places to form the parallel-sided slots *J*. These slots, which terminate approximately 1/8 inch from end plates *D*, provide clearance for movable lock-screw *F*. To transfer slide *E* from one slot to the other, it is only necessary to back-off the lock-screw so that its tip will clear the solid wall left between the slots.

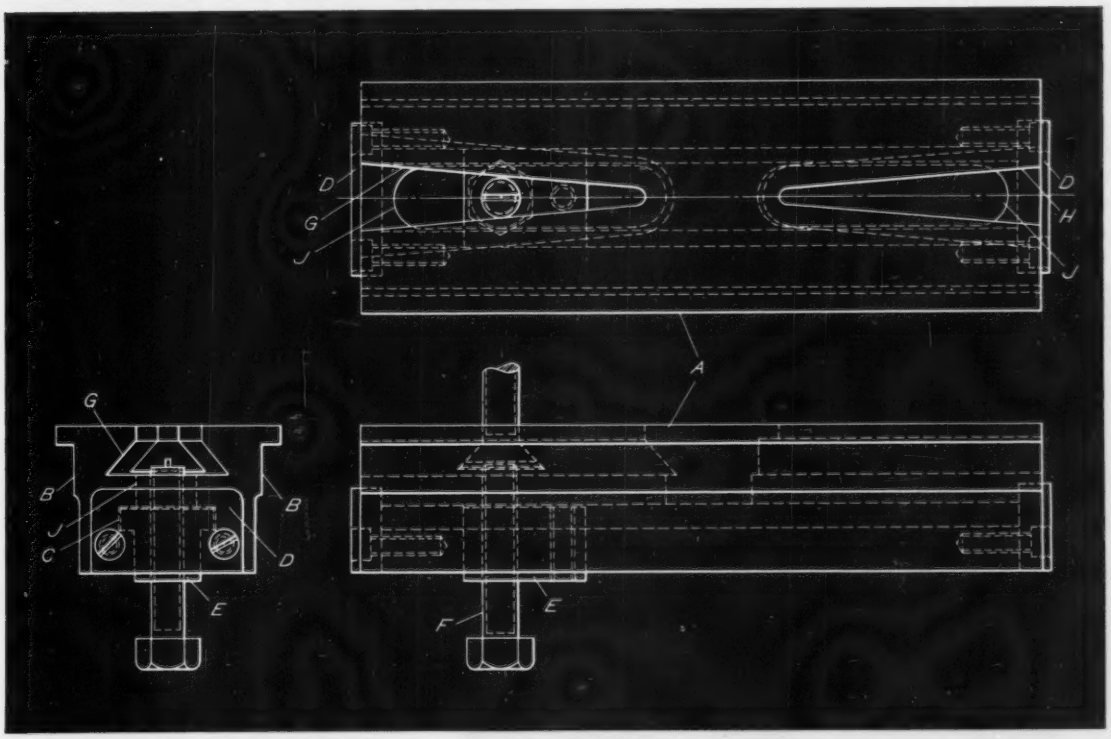
To use this fixture, the screw to be gripped (in this case a flat-head screw) is slipped into slot *G* from the left-hand end until its shank bears against the sides of the slot. Sliding T-shaped member *E* is then moved along slot *C* so as to centralize lock-screw *F* with the head of the work-piece. Screw *F* is then threaded further into the slide until it engages the slot in the screw-head. Slight additional rotation of the lock-screw will bind the head of the work-piece tightly against the inclined sides of slot *G*. The fixture is then clamped between the jaws of a vise by gripping it on steps *B*.

* * *

Record Use of Zinc Die-Cast Grilles in 1955 Automobiles

A study just completed by the American Zinc Institute, New York City, has revealed that 62 per cent of the 1955 automobiles make use of zinc die-cast grilles. This heavy demand for zinc die-castings in the important automotive market has been a key factor in the sharp up-swing in shipments of zinc alloy during recent months.

Institute figures show that the grilles found on the Chrysler Imperial and Buick automobiles contain 25 pounds of zinc alloy each. Grilles of the Studebaker and Packard Clipper lines, each using 22 pounds of zinc alloy, are next in size. Also having grilles weighing 20 pounds or more are the Kaiser, 21.4 pounds; Nash, 20 pounds; and the Packard Patrician, 20 pounds. Other automobiles incorporating zinc die-cast grilles in their latest models are Willys, 19.8 pounds; Hudson, 19 pounds; De Soto, 15 pounds; Nash Rambler, 9.5 pounds; and Chevrolet, 6 pounds.



Simple vise fixture holds screws securely for modification

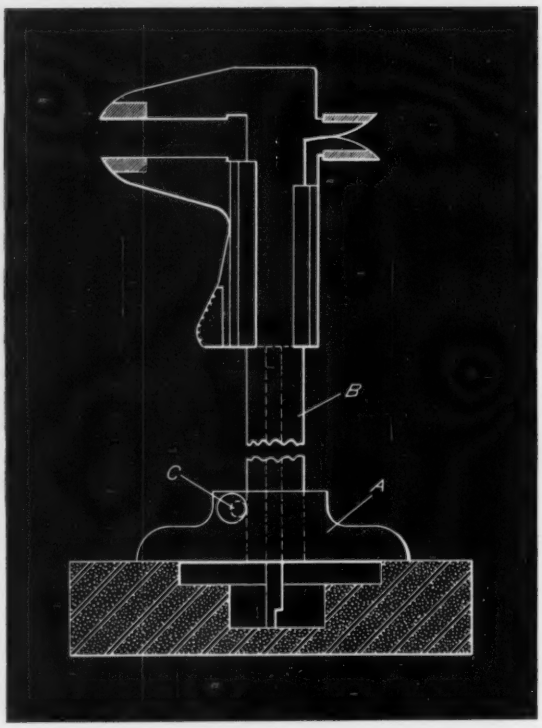
Ideas for Shop and Drafting-Room

Depth Gage Attachment for Vernier Caliper

By K. H. STEENBURGH, Schenectady, N. Y.

The usefulness of a vernier caliper as a depth gage is often limited to checking the depths of holes that are smaller in diameter than the width of the caliper bar. This restriction can be eliminated by using the attachment illustrated.

A base member *A* is fastened to the graduated bar *B* of the caliper by a cam lock, set-screw, or any other suitable means *C*, whereby it can be removed at will. When locking the attachment in place, care must be taken to be sure that its banking edge is perfectly flush with the end of the caliper bar. This precaution is necessary to insure accurate readings. With the attachment in place, the caliper doubles as a conventional vernier depth gage.



Attachment converts vernier caliper to a conventional vernier depth gage

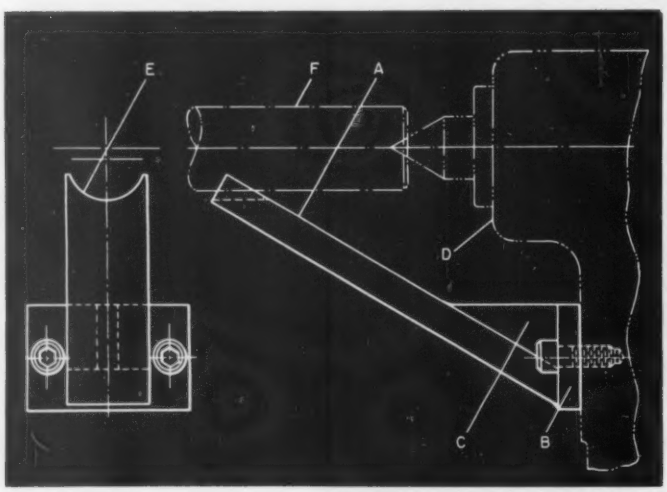
Support Bracket Holds End of Work-Arbor

By ROGER ISETTS, Kenosha, Wis.

In lathe operations involving the use of a loaded work-arbor, difficulty is often experienced in supporting the free end of the arbor while advancing the tailstock center. This is especially true if the work-piece is very heavy. The illustrated support is a simple and inexpensive answer to the problem of reducing operator fatigue and the possibility of a serious accident.

The support bracket is a sturdy weldment consisting of projecting arm *A*, mounting flange *B*, and triangular brace *C*. Two cap-screws are employed to secure the unit directly to tailstock *D* of the lathe.

When locating the mounting holes for the bracket, care should be taken that the center of milled radius *E* is situated slightly below the center line of the machine spindle. Thus, the operator merely places the forward end of the arbor on the live center, and rests the back end *F* on the support bracket. His hands are then free to advance the tailstock center which, in turn, lifts the arbor from the support. By this action the support remains clear of the arbor during machining and need not be removed. The work-piece may be removed by reversing the procedure.



A welded bracket supports the back end of work-arbor while tailstock center is being advanced.

Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Planning, Administration, and Personal Contact

THE capable sales manager is alert to how his salesmen divide their time between travel, customer contact, and office affairs. In order to apportion time to best advantage, it is usually desirable to space it equally between planning, administration, and personal contact with key people.

Sales managers are too frequently lop-sided in their division of these functions. Some are always making plans, others sit at their desks and direct, and still others are super salesmen busy on the front line. Balanced effort is a prime necessity.

One sales manager of my acquaintance is a superlative planner—rich in ideas. When one plan is completed, he undertakes the next one, or retailors the plan already made. Complicated systems are carefully set up, but without due regard to the cost of maintaining them.

Another sales manager is a desk executive. He issues orders, constantly writes letters, sends telegrams and makes phone calls. He presses this button and that like a master robot in an ivory tower.

Still another sales manager is continually on-the-go. No one can accuse him of not knowing what goes on in the field. His salesmen know he will be on hand when a key job is active. He is a keen marksman when it comes to the kill, and so his salesmen depend on him to help do the shooting.

The division of time of each sales manager is off balance. He is concentrating on only one phase of executive action.

Planning

The pending order, the specific promotional campaign, or the coming sales meeting attract the sales manager most at a specific time. The further he projects planning into the future, the more nebulous the matter is—and, consequently, the easier to set aside. He could profitably divide his planning into a short-term, covering two months or a year, and a long-term, covering, for example, a five-year period.

When a sales manager is questioned concerning his plans, he almost invariably discusses what he intends to accomplish during the coming year. He seldom alludes to more distant objectives. Yet of all company officials, who should be more interested and influential than he in determining where his company will be five years from now?

Administration

Once sales plans are made, they are too often considered an end reached when they merely constitute a route to follow. With the route set, how is it being followed? Are schedules met? Does the sales manager react promptly to unforeseen obstacles?

Execution is nothing more nor less than consistently following up plans. The art of successful execution requires unusual skill, because it involves a high degree of tact in dealing with associates. Plans are carried out through others. Responsibilities and duties must be defined and assigned. Incentives must be set up. Diplomacy, tact, enthusiasm, and the ability to spread a feeling of urgency are all necessary. Time is an essential element. Certain sales engineers may have to be held back, but a greater number must be encouraged to proceed.

Personal Contact

What sales manager can keep informed, and particularly "get the feel" unless he associates with his salesmen in the field, attends pertinent industry meetings, and meets high customer executives and competitors. Besides these outside contacts, the sales manager should sell the needs of his market to other headquarters' executives, and through friendly contact understand their problems and needs.

It is natural to study the work of sales associates, both at headquarters and in the field. However, the sales manager should also examine his own work carefully to see if he wisely apportions his attention between planning, administration, and personal contact.

LATEST DEVELOPMENTS IN *Shop*

LeBlond Crank-Turning Lathes

The LeBlond Machine Tool Co., Cincinnati, Ohio, has developed two crank-turning lathes which have been assembled in an automatic unit for turning and facing precision-cast V-8 engine crankshafts. Two of these automatic units, each with a production capacity of fifty-five crankshafts per hour, can be handled by one operator. At this production rate sufficient time is allowed for changing tools and making machine adjustments. A production unit consists of the two lathes and a gaging machine.

The LeBlond LBA automatic line-bearing center-drive lathe shown at the right in Fig. 1, is equipped with an automatic chuck and tool blocks, see Fig. 2. This lathe turns all five main bearings, flange and pilot, sprocket diameter, and front-end of a crankshaft simultaneously. Following these operations the crankshaft is automatically transferred to a Sheffield gage, in which the diameters of the Nos. 1, 3, and 5 main bearings, and the width of the thrust wall of the No. 3 main bearing are gaged automatically.

The automation system in which the crankshaft-turning unit is installed then transfers the gaged crankshaft to the LeBlond PBA automatic two-spindle lathe, seen at the left, Fig. 1. When two crankshafts have been transferred to this machine, their pin bearings are turned simultaneously. The turning operations on the pin bearings of the two crankshafts shown in Fig. 3 have been completed and the steadyrest caps of the work fixtures have been opened. Next the automatic loader picks up the machined crankshafts and returns them to the production line for succeeding operations.

Relatively high-production speed is made possible by the precision shell-molding process by which the crankshafts are cast to size within close tolerances. All the motions of the machines are electrically and hydraulically timed for continuous automatic operation. The console type, push-button operating station includes signal lights which indicate certain conditions throughout the operating cycle. Manual controls are provided for use in changing tools and setting up, repairing, or adjusting the machines.

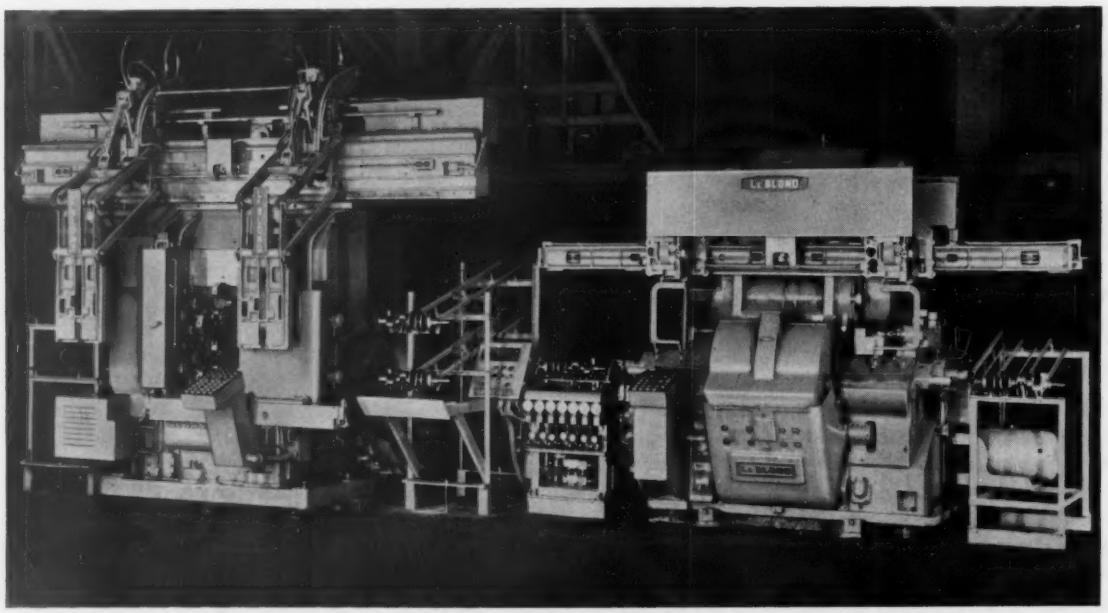


Fig. 1. LeBlond automatic crankshaft-turning unit with two lathes, gage, controls, and signal equipment

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

Before arriving at the turning unit shown in Fig. 2, the rough crankshafts are prepared by centering and milling the ends and locating spots on three lobes. Thus prepared a crankshaft is picked up by the automatic loader hooks of the line-bearing machine and delivered to the chuck.

Locating centers are inserted hydraulically into the rough crankshaft, positioning being accomplished by the center at the left end of the work which moves in at a faster rate than the one at the opposite end. In the meantime, the gaging machine has checked the previously turned crankshaft. If acceptable, it is ejected to the rear transfer line and the "all clear" signal is given. Otherwise the crankshaft remains in the gage and a red light on the panel indicates faulty operation. When adjustments have been made, the gage is cleared by hand.

Crankshafts with the main bearings turned and checked by the gaging unit are delivered to the pick-up station of the two-spindle PBA lathe at the left. Two crankshafts are picked up by the automatic loader hooks of this machine and delivered to the chucks while two previously finished crankshafts are removed from the chucks and placed in the outgoing production line.

Tools in the four holders, Fig. 3, are actuated by an upper and lower master crankshaft and fed into the work by means of a massive cradle. As the crankshafts rotate, the tool blocks move around with the pin bearings, permitting the cuts to be taken. The cycle is the same as that of the other machine at the right and consists of traversing, feeding, dwelling, and retracting.

Circle Item 101 on postcard, page 257

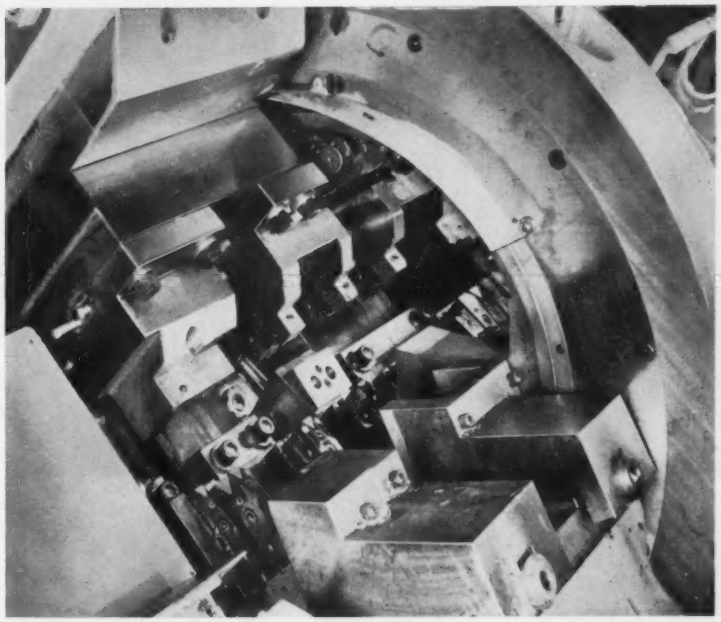
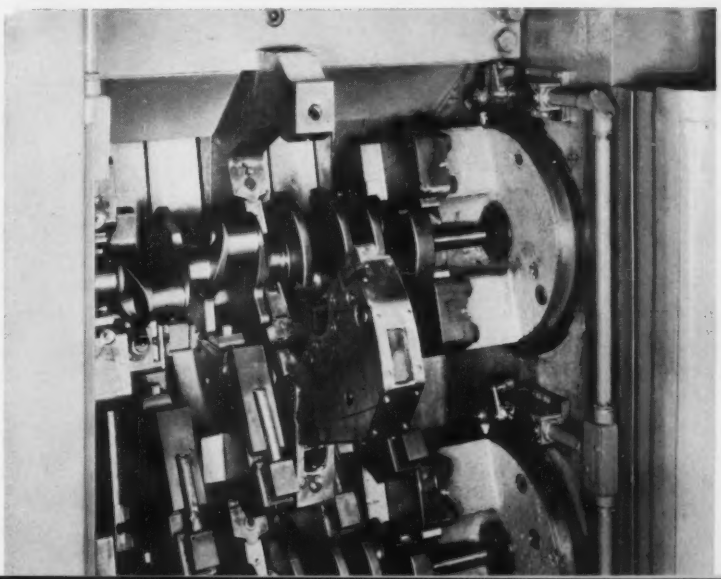
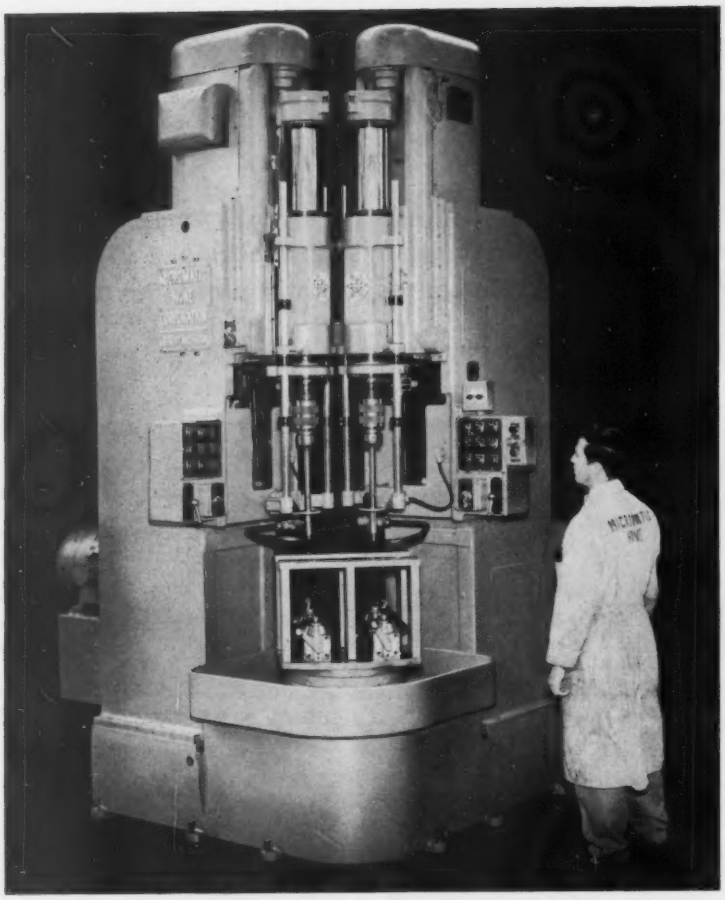
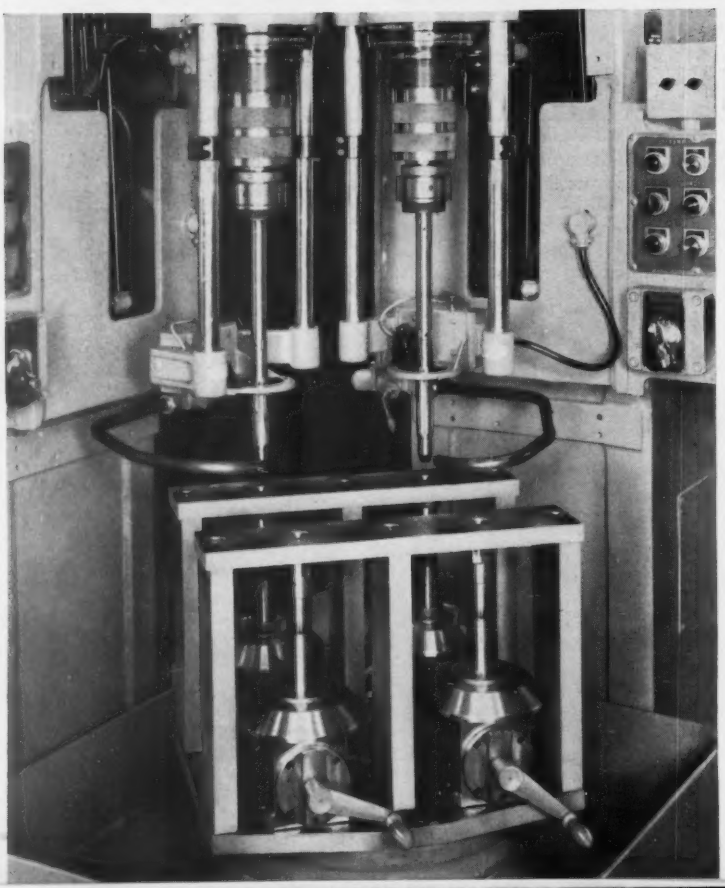


Fig. 2. Close-up of automatic chuck and tool blocks of the LeBlond LBA automatic line-bearing center-drive lathe seen at right in Fig. 1

Fig. 3. Close-up of machined crankshafts and PBA automatic two-spindle pin-bearing machine seen at the left in the assembled unit, Fig. 1







Double-Spindle Vertical Honing Machine

The Micromatic Hone Corporation, Detroit, Mich., has developed a double-spindle hydraulically operated vertical honing machine designated as the Model 730-2 Hydrohoner. Two basic units, with separate columns for each spindle, are incorporated in this machine. Equipment includes a Microdial automatic abrasive feed-out device which compensates for hone wear and a Microsize automatic sizing control unit. Provision is made for automatic starting and stopping of the coolant flow and for automatic time cycle control. A three-speed transmission unit controls rotation of each spindle. The hone is reciprocated hydraulically in a range of from 0 to about 60 surface feet per minute.

The automatic rotary index-table controls are interlocked with the machine controls. The four-station fixture makes possible the honing of two parts simultaneously while two stations are being unloaded and loaded.

Transmission converter reaction shafts are finished on one of these machines in an operating cycle of ninty-six seconds. These open-end shafts have an inside diameter of 1.0835 to 1.0855 inches and a length of 7 inches. The material is S A E 1052 seamless steel tubing, heat-treated to give a Rockwell hardness reading of 30 to 35. From 0.004 to 0.005 inch of stock is removed to obtain a finish of 20 to 25 micro-inches r.m.s.

The work is held to tolerances of 0.0005 inch for size, and 0.0002 inch for roundness and taper. Forty-six to fifty-six pieces are finished per set of honing stones.

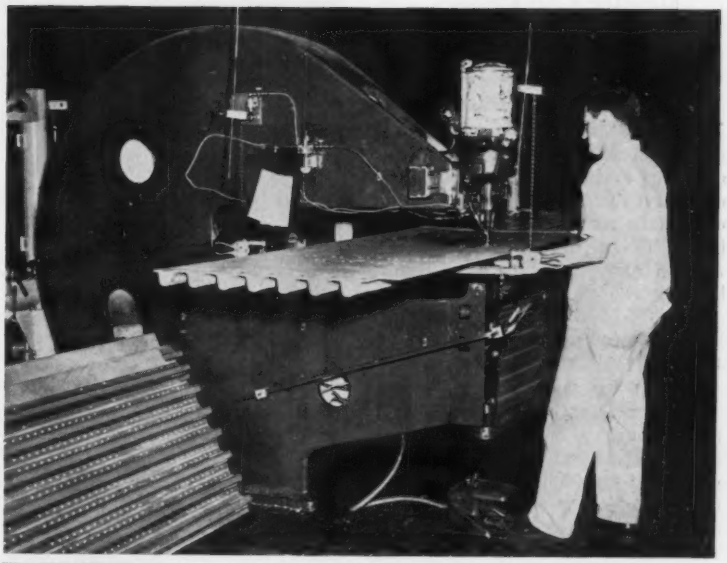
Circle Item 102 on postcard, page 257

Automatic Punching and Riveting Machines

Electrically controlled models of automatic punching and riveting machines with diameter capacities up to 1/4 inch and throat depths of 18, 36, and 48 inches have been announced by the En-

Fig. 1. (Above) Hydrohoner vertical honing machine brought out by the Micromatic Hone Corporation

Fig. 2. (Left) Close-up view of work-holding fixtures and hones of double-spindle machine shown in Fig. 1



Improved automatic punching and riveting machine made by ACF Industries, Incorporated

gineering and Research Division of ACF Industries, Incorporated, Riverdale, Md.

These machines are designed to punch, or punch and press-dimple, holes for flush-head rivets, and automatically feed and head rivets. They are electrically activated and interlocked and have a pneumatic shift arrangement with hydraulic snubbing action for speed control, air stripper, air-driven hopper drum, and electric safety control. With an air pressure of 90 to 100 pounds per square inch on the driving plunger, the machine can handle up to forty-five rivets per minute.

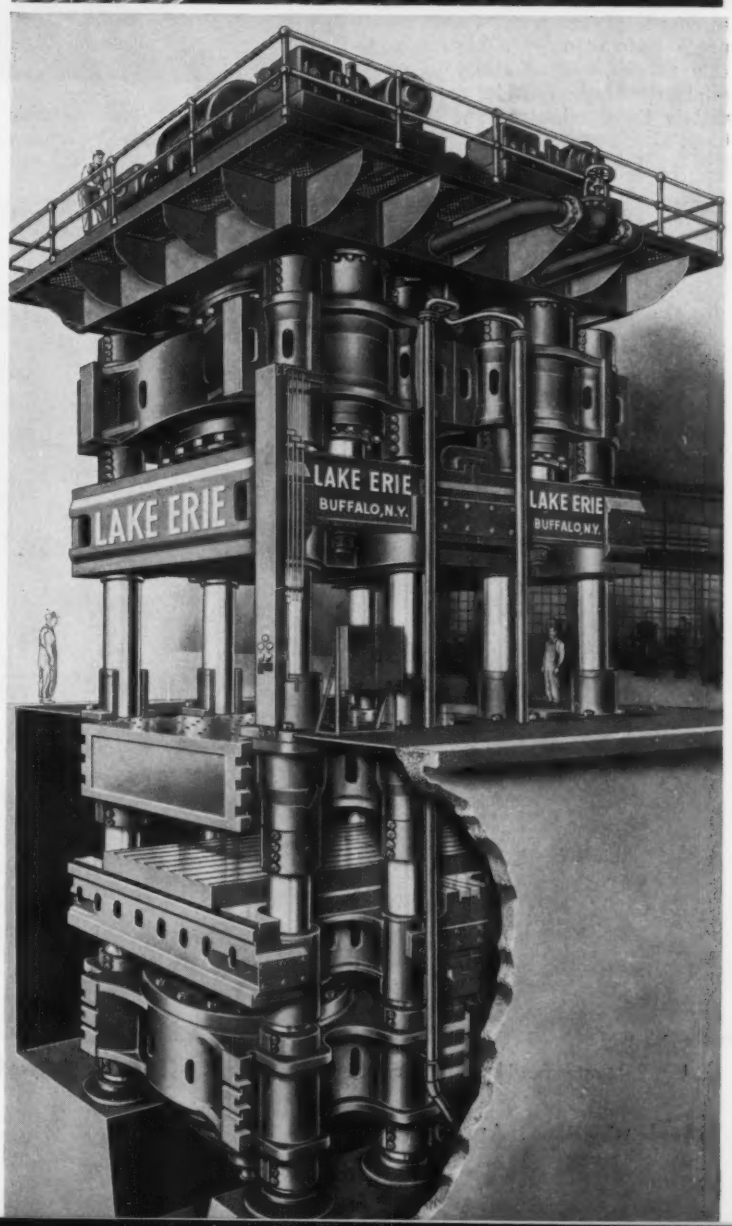
Circle Item 103 on postcard, page 257

Gigantic Metal-Forming Press for Aircraft Plant

The Lake Erie Engineering Corporation, Buffalo, N. Y., has announced the delivery of a gigantic 10,000-ton metal-forming hydraulic press to the McDonnell Aircraft Corporation, St. Louis, Mo. This machine, believed to be the largest of its type in the world, consists of two 5000-ton self-contained units which can be operated either individually or simultaneously. Each of the two units is a single-action column type press with a 4500-ton cushion. A front-to-back alignment of the two rigidly joined presses provides a bed 288 inches long which measures 110 1/2 inches right to left between column stops. A clamping arrangement between the separate draw platens permits conversion from 5000-ton individual to 10,000-ton dual operation. An identical arrangement between the cushion platens permits conversion from 4500-ton individual to 9000-ton combined operation.

Each draw ram has a stroke of 60 inches while the cushion rams have a stroke of 30 inches. Each cushion pad is 102 inches wide by 138 inches long. The over-all height is 52 feet and the combined weight is 3,200,000 pounds. The closing speed is 425 inches per minute and the pressing speed, 20.5 inches per minute.

Circle Item 104 on postcard, page 257



Metal-forming hydraulic press built by Lake Erie Engineering Corporation.

Minster Gap Presses Built in Fixed-Base and Inclinable Types

The Minster Machine Co., Minster, Ohio, has announced two gap presses, one having a 150-ton capacity and the other a 200-ton capacity. They are available in either the fixed-base or inclinable type. These presses have steel frames and, if required, cabinet legs for electrical and air controls.

The GI-150 inclinable and fixed-base 150-ton presses shown in Figs. 1 and 2, have a standard stroke of 6 inches, and operating speeds of from 80 to 105 strokes per minute in the flywheel type and 30 strokes per minute in the geared type. The bed area of these presses is 30 by 50 inches and the slide area 24 by 24 inches. An electric motorized inclining mechanism incorporated in the press shown in Fig. 1 permits this machine to be tilted to an angle of 30 degrees in approximately three minutes. The fixed-base, single-geared press, Fig. 2,

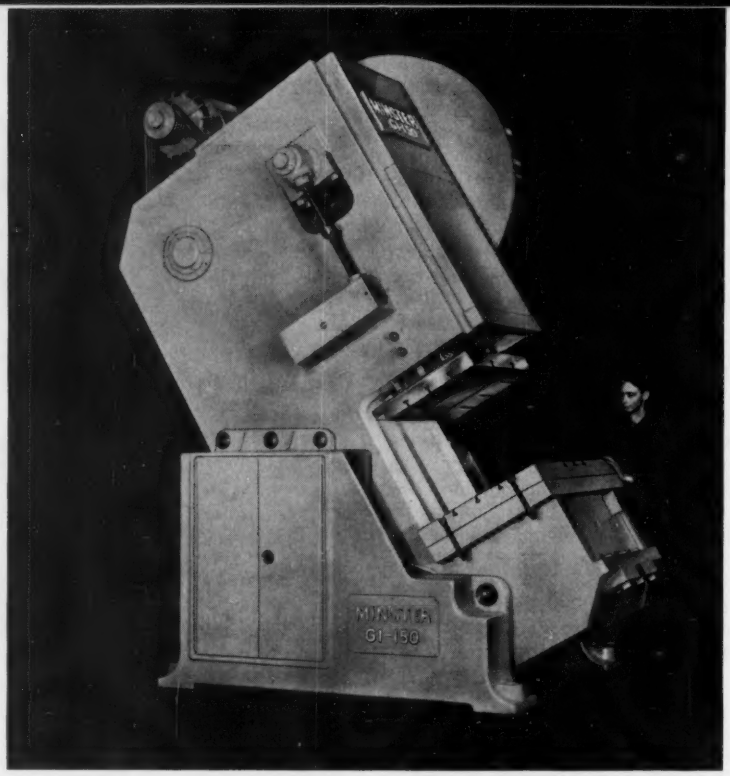


Fig. 1. Minster 150-ton inclinable gap press of steel frame construction equipped with electric motorized inclining mechanism

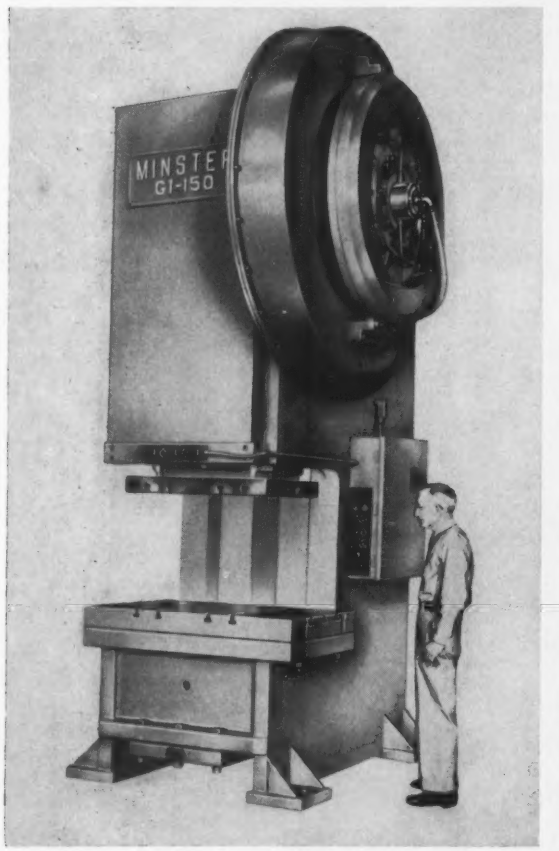


Fig. 2. Minster fixed-base press of 150-ton capacity

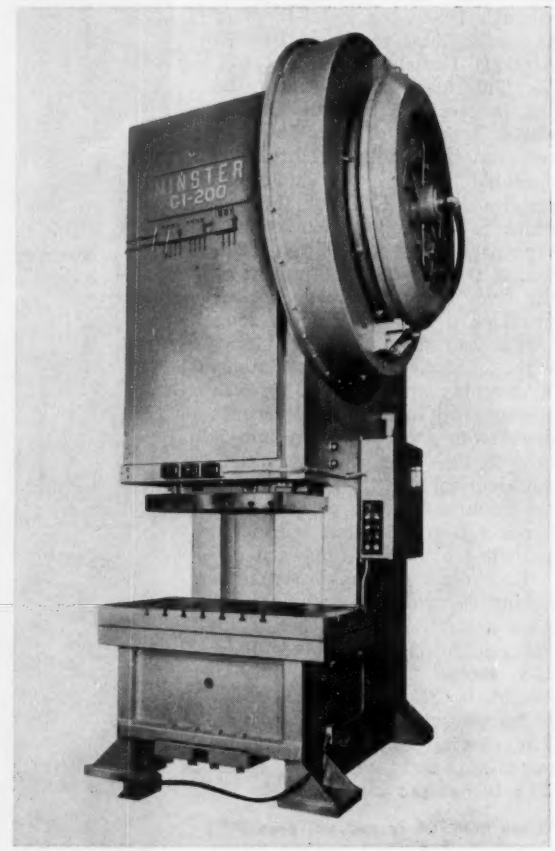


Fig. 3. Fixed-base model of Minster 200-ton press

has a patented Minster clutch-in-gear arrangement with all gears totally enclosed and running in oil.

The GI-200 gap press, Fig. 3, has a capacity of 200 tons, a stroke of 8 inches, a bed area of 34 by 58 inches and a slide area of 28 by 36 inches. The geared model has a speed of 28 strokes per minute. This press has barrel slide adjustment and its slide ways are of exceptional length. Cross-bar type and cam knock-outs are available as extra equipment. Pneumatic counterbalance cylinders are standard equipment.

Circle Item 105 on postcard, page 257

Millholland Vertical Indexing Machine

A twelve-station vertical indexing machine with thirty-four spindles which has a cycle operating time of thirty-one seconds is a recent development of the W. K. Millholland Machinery Co., Inc., Indianapolis, Ind. The production rate of this machine when operating at an efficiency of 80 per cent is ninety-three pieces per hour. Two Millholland No. 5 automatic units mounted vertically, a No. 2 unit mounted horizontally on a rapid travel slide, and an automatic lead-screw tapper with a reversing motor that drives a six-spindle tapping head are incorporated in the machine.

The special design of the plate type cam and the action of the pneumatic counterbalance of the automatic units make it possible for the cutters to be engaged in removing metal 80 per cent of the total cycle time. Drilling, reaming, and countersinking operations are performed by a twenty-two-spindle, high-speed, pressure lubricated head of the first unit. The vertical drill units are powered by 10-H.P. motors, the taper unit by a 5-H.P. reversible motor, and the horizontal unit by a 3/4-H.P. motor.

The compact work-holding fixtures are mounted on an independently powered automatic indexing table with self-contained lubrication pump. All machine elements are electrically synchronized and arranged for push-button control. The simplified chip disposal system consists of a ring mounted on the index-table, and blades which rotate within the ring to bring the chips to a removable pan.

Circle Item 106 on postcard, page 257

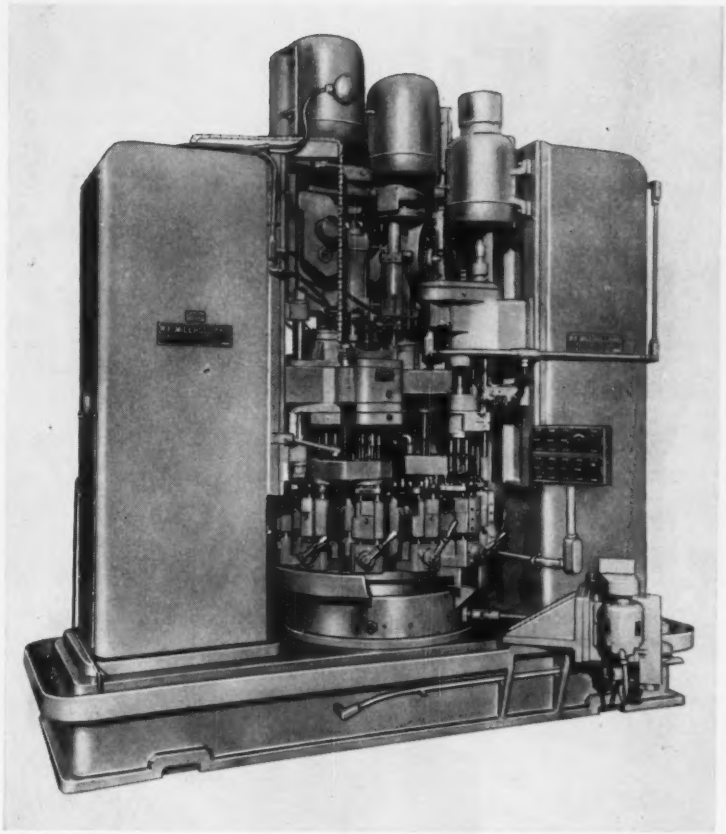


Fig. 1. Millholland twelve-station vertical indexing machine

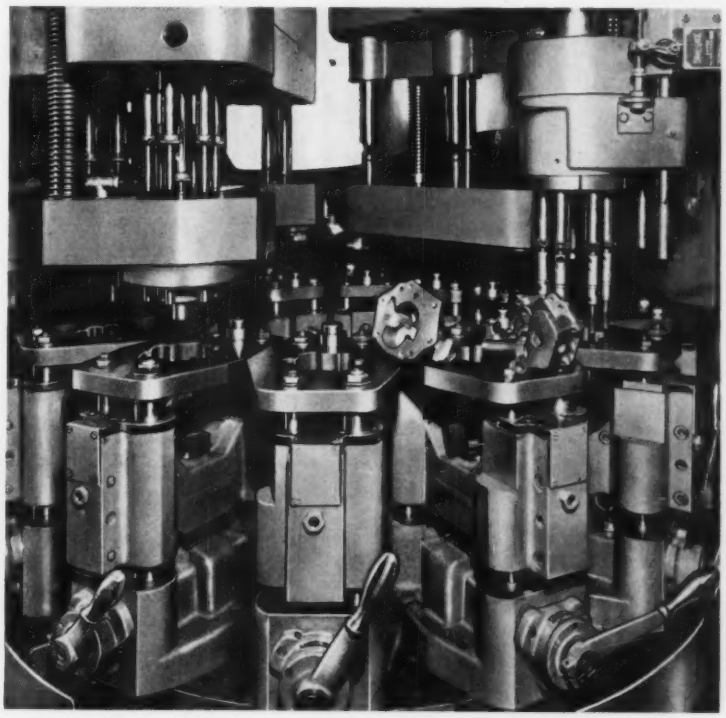
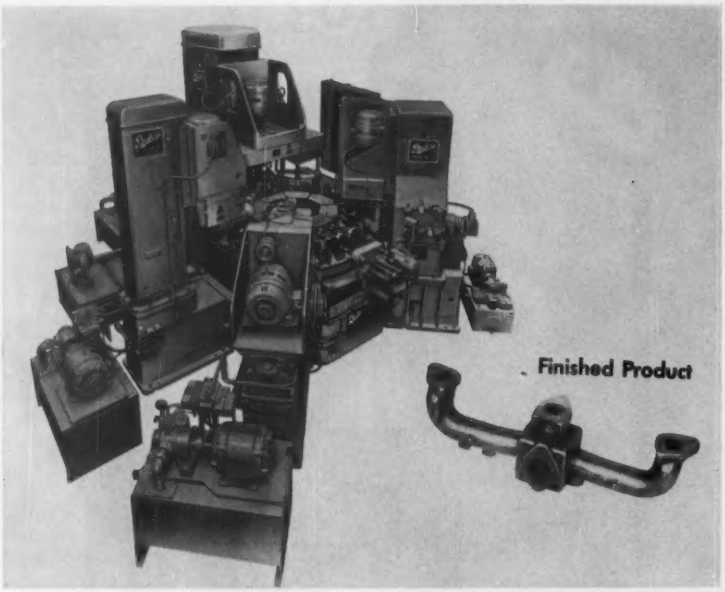


Fig. 2. Close-up of work-holding fixtures and tool equipment shown in Fig. 1



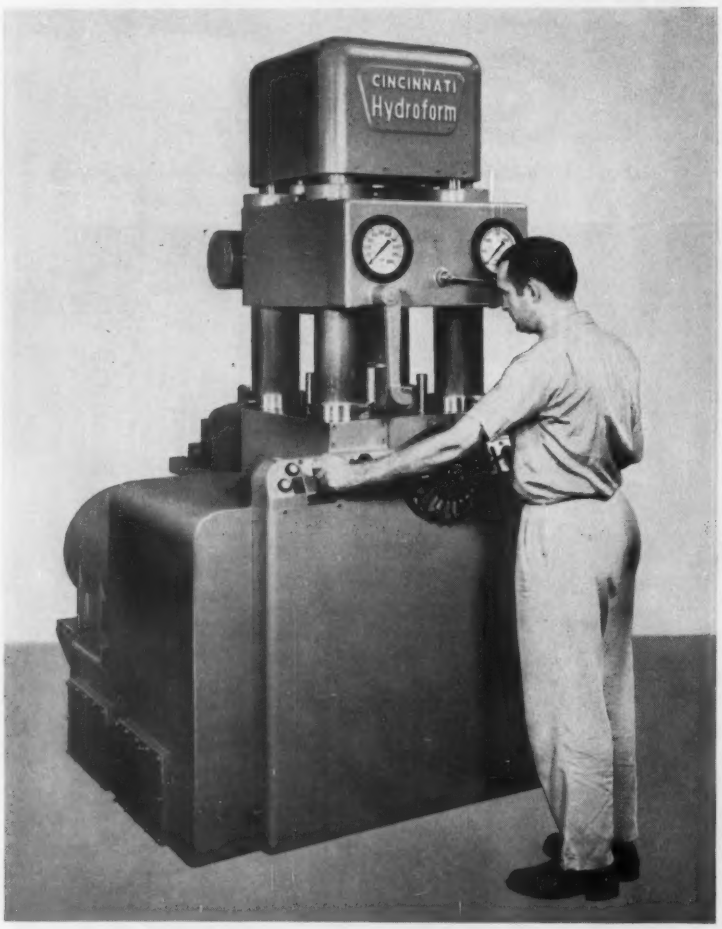
Dial type automatic indexing machine for processing intake manifolds, built by the Buhr Machine Tool Co.

Buhr Dial Type Manifold Processing Machine

A six-way, dial type machine with hydraulic feed which has a capacity for processing 206 intake manifolds per hour is announced by the Buhr Machine Tool Co., Ann Arbor, Mich. The machine performs milling, core-drilling, drilling, countersinking and individual lead-screw tapping operations on manifolds like the one shown in lower right-hand corner of illustration. The manifolds are loaded, one part per station, in each of the eight single-place fixtures and are automatically indexed by the eight-position table. The indexing table is 72 inches in diameter and is furnished complete with shot bolt. A chip trough and paddles are provided for chip disposal. Clamping is accomplished by a torque-controlled power wrench.

Hardened and ground laminated tool-steel lubricated ways comprise one of the regular features of this machine. Other features include: complete interchangeability of parts, achieved by holding all parts to close tolerances and locating all component assemblies by precision-bored dowel holes; multiple heads of Buhr ball-bearing construction with shaved gears and broached and splined drives; precision-ground individual lead-screw tapping spindles; and electrically controlled automatic indexing mechanism.

Circle Item 107 on postcard, page 257



Hydroform machine designed for deep-drawing and forming small metal parts

Cincinnati Hydroform Machine

The Process Machinery Division of the Cincinnati Milling Machine Co., Cincinnati, Ohio, has added to its line of Hydroform machines an 8-inch model designed to produce a variety of small, deep-drawn and formed sheet metal parts.

The Hydroforming process makes use of a male punch and a flexible die member backed up by hydraulic oil pressure which may be accurately controlled up to 15,000 pounds per square inch. The flexible die member reduces die costs, as well as the number of operations required to produce parts that are difficult to form.

The new machine will form parts from sheet metal blanks up to 8 inches in diameter with a maximum draw depth of 5 inches. Practically all sheet metals in

Jig boring machine introduced in this country by the Cosa Corporation

gages up to 1/4 inch can be drawn. The maximum operating rate is 200 cycles per hour. The machine is self-contained and designed for floor mounting. It is 60 by 60 by 90 inches high and weighs 12,000 pounds.

Circle Item 108 on postcard, page 257

Jig Boring Machine with Push-Button Control

Work-pieces can be quickly positioned within accuracy limits of 0.000125 inch on the Kolb jig borer introduced by the Cosa Corporation, New York City. Push-button control provides for pre-selection of eighteen feeds and thirty-six speeds. The electro-hydraulic clamping arrangement is said to be shock- and distortion-free, and, therefore, does not impair accuracy.

Signal lights indicate if head and table are clamped or unclamped. The machine can be used for drilling, boring, reaming, tapping, and milling as well as for precision measuring. The optical system has a magnification of 100X. Thus, 5 inches on the focussing screen is equivalent to a table movement of 0.05 inch. The table has a working surface 69 by 39 inches. The clearance between columns is 73 inches and the maximum distance between spindle and table, 40 inches.

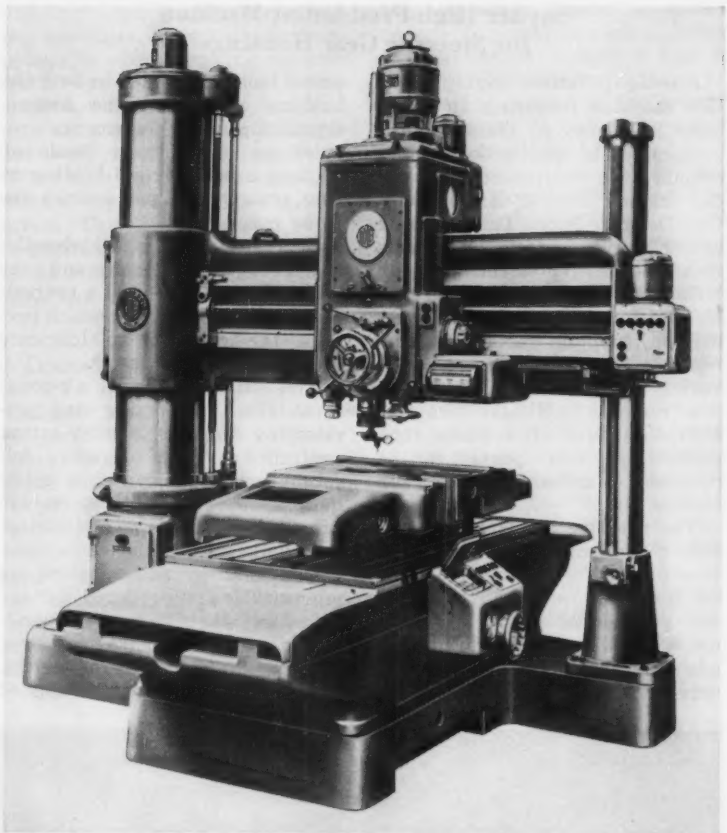
Circle Item 109 on postcard, page 257

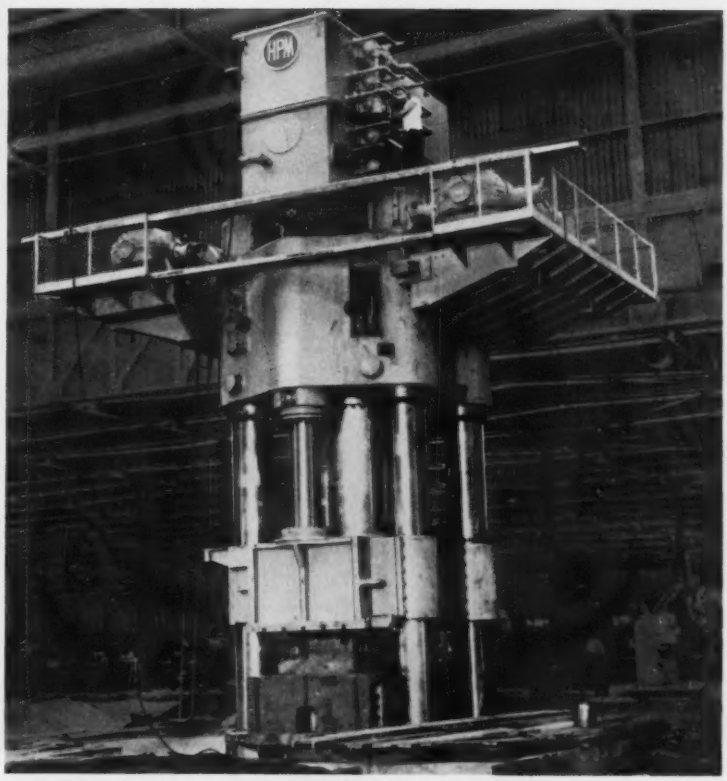
Giant Size H-P-M Hydraulic Press

A huge 7000-ton hydraulic press for producing complex aircraft parts has been built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, for the McDonnell Aircraft Corporation's plant in St. Louis, Mo.

The base of the press, which is housed in concrete, extends 15 feet below the floor level. This press is now being used to form complicated contours on parts such as stainless-steel blast inlet ducts in an armament assembly for jet planes. The press utilizes the Hidraw principle of deep-drawing metal parts by a combination cushion and rubber-pad process.

Circle Item 110 on postcard, page 257





H-P-M giant size press built for use in aircraft plant

Snyder High-Production Machine for Steering Gear Housings

An eight-station, high-production machine featuring an index table 96 inches in diameter has been added to the line of center-column type equipment made by the Snyder Tool & Engineering Co., Detroit, Mich. This machine is designed to process 230 cast-iron automotive steering gear housings per hour, but it can also be used for close-tolerance boring, drilling, tapping, facing and line reaming operations on a wide variety of parts. Each fixture on this machine will take two medium-sized production parts, thus permitting two parts to be processed simultaneously at each station.

The machine is adapted to carbide tooling applications on cast-iron parts. The center column is 14 feet high and has hardened and ground flat ways. The ways are of sufficient length to provide adequate vertical head travel for accurate line reaming operations where tools are piloted in both the bushing plate and the fixture. Equalizing clamp fingers are provided on the vertical heads of stations used for rigid holding of long, unsupported parts which are to be core-drilled.

The table is indexed hydraulically through a fluid motor and gear train. The machine has a centralized lubrication system which permits the operator to lubricate each fixture individually.

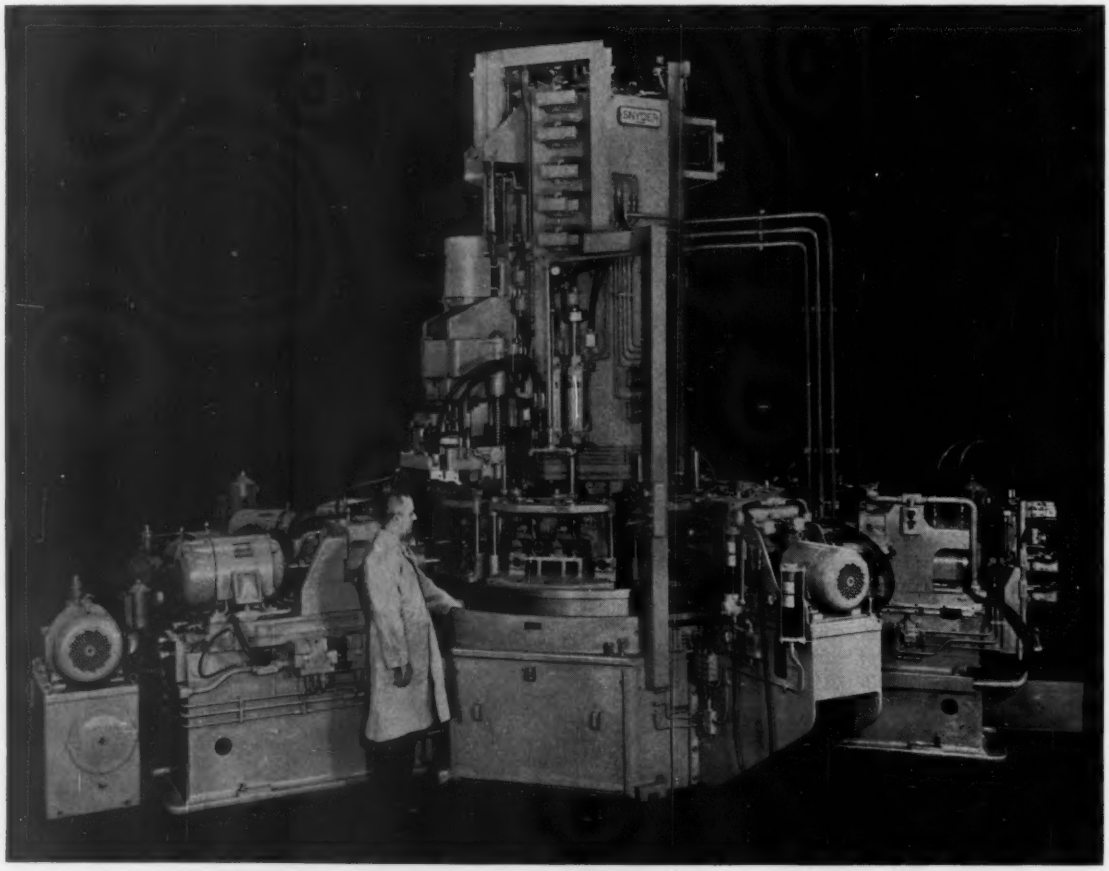
The vertical heads are air-counterweighted. Clamping and unclamping of parts is push-button controlled by the operator. Adjacent individual hydraulic cylinders at the loading station are provided for the separate clamping and unclamping functions. The clamping and unclamping movements are produced by the cylinders through a rack-and-pinion mechanism, an Acme screw, and an equalizing arrangement. The pre-set tool system is applied to this machine, and the tools are mounted on a tool control board to facilitate servicing.

Circle Item 111 on postcard, page 257

Johnson Water-Soluble Coolant Developed to Eliminate Odors

The problem of eliminating the offensive odors caused by rancid water-soluble coolants is said to have been solved by the use of a new cutting fluid developed by the Johnson's Wax Co., Racine, Wis. This new water-soluble cutting fluid, known as Johnson's TL-131, will be marketed with a money back guarantee that it will not cause foul coolant odors for two full months. This is sufficient time to carry the average shop through the hot, humid days of summer when coolant odors are most widespread.

This product is used in the same way as any conventional water-soluble coolant, the only requirement is that the machine



High-production index-table machine added to the center-column type equipment made by the Snyder Tool & Engineering Co.

be cleaned and then completely recharged with TL-131. The coolant requires no formaldehyde or bactericides before it is placed in a machine.

The foul air condition found in metal-working shops, frequently called "Monday morning odor," is actually hydrogen sulphide gas that has been released by bacteria in the machines. The bacteria live and multiply in the bottom of the coolant sump, along coolant pipes, and in the inaccessible corners of the machines. This bacteria lives primarily upon decaying organic matter such as the nourishing substance found in all animal and vegetable cells. Since TL-131 coolant is all chemical in composition it contains no fats or vegetable matter on which bacteria can breed. This is the reason why bacteria do not survive in TL-131 in its concentrated form.

Circle Item 112 on postcard, page 257

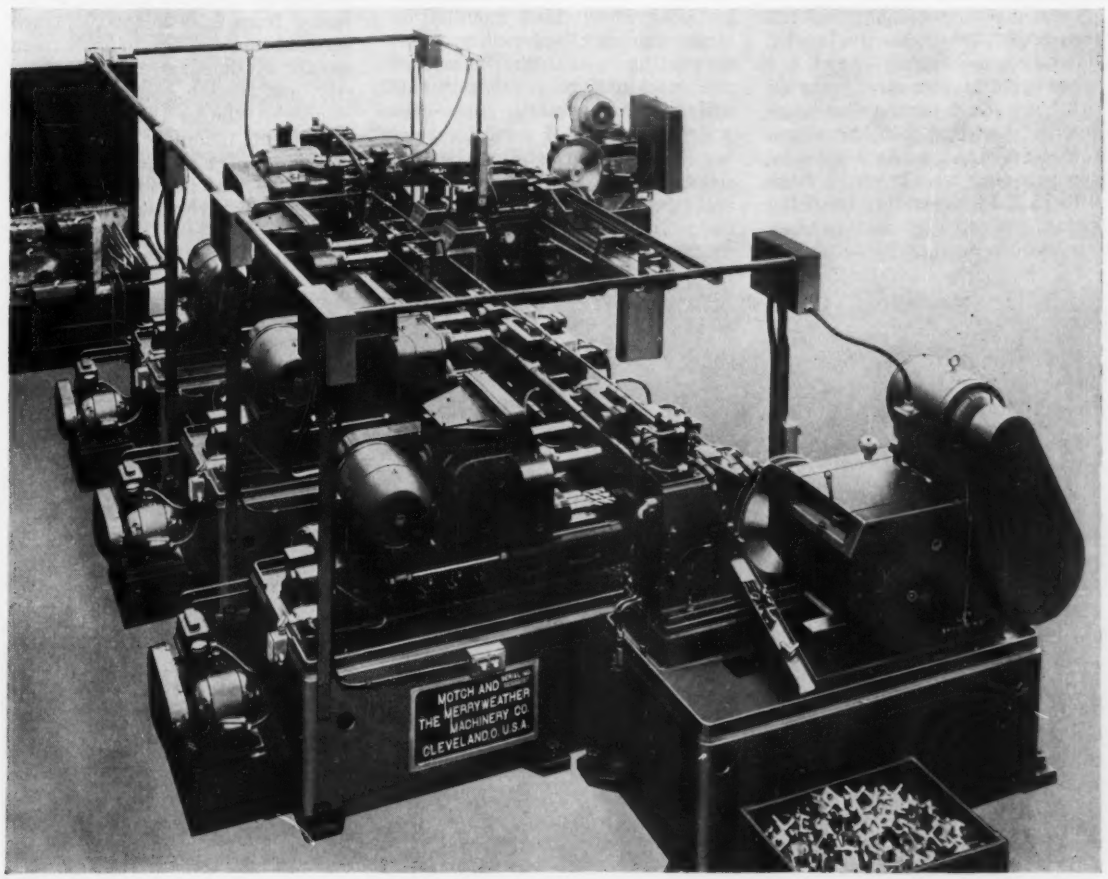
Motch & Merryweather Transfer Machine

A fifteen-station, in-line type transfer machine built of standard units has been announced by the Motch & Merryweather Machinery Co., Cleveland, Ohio. This machine is equipped to process refrigerator cylinder brackets made from 3- by 2 1/2- by 1/2-inch hot-rolled angle-iron at a production rate of 380 pieces per hour.

Sections of the angle-iron of sufficient length to make three complete refrigerator cylinder brackets are cut from the bar stock at the first station, which is provided with a cut-off saw unit. The cut off sections are discharged from the saw unit into a lateral conveyor for loading into the main straight-line transfer machine by means of an indexing arrangement.

At the first machining station, the angle-iron section is milled on one face and one edge. From this station it is moved into a barrel type turn-over fixture in which it is carried to the second station where the other face and edge are milled.

Three holes are drilled and reamed in the next station, and in the succeeding station twelve holes are drilled and six holes are reamed by a similar set-up. Following these machining operations the parts enter a second barrel type turn-over fixture which positions them for the end-milling of seven holes. The milling, reaming and drilling stations are equipped with 15-H.P. way type power units which have multiple-spindle heads. At the last station, a saw head equipped with two circular saw blades is employed to cut the stock into three completed pieces. The sawing operations at the first and last stations are performed accurately by the Motch & Merryweather "Triple-Chip Method."



Transfer machine for processing refrigerator cylinder brackets announced by the Motch & Merryweather Machinery Co.

The machine units are hydraulically actuated and electrically controlled. Safety limit switches are provided at each station. The transfer bar with pusher fingers is attached to the milling units. This eliminates milling-cutter drag marks, because the part is moved from station to station on supporting rails during the rapid return strokes of the milling units. The main base has space for a coolant sump and chip conveyor.

Special piping provides for an intermittent air jet and a heavy coolant wash to prolong tool life and to wash chips from the work and transfer rails. Ample spacing of the units gives easy access to the tools. The work is located and hydraulically clamped at each station. A tool board is provided for automatic tool cycle control, tool storage and for pre-setting gages for all tools.

Circle Item 113 on postcard, page 257

Hanchett Heavy-Duty Knife, Shear Blade, and Flat Surface Grinders

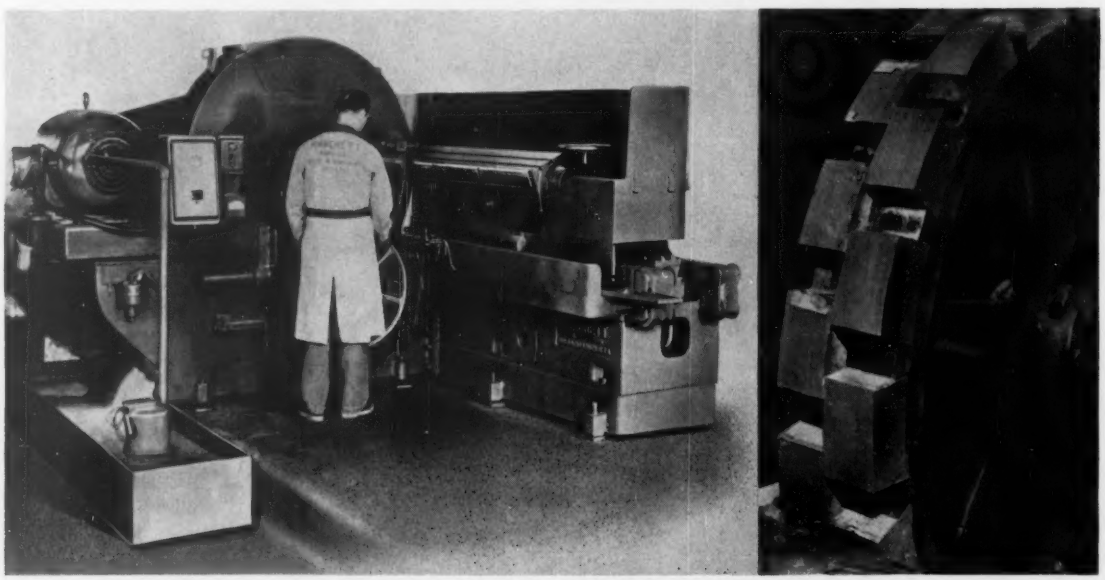
Two machines developed for accurate grinding of shear blades, knives, and flat surface work at very high-production rates have been added to the line of automatic grinding equipment built by the Hanchett Mfg. Co., Big Rapids, Mich. The "Big 60 Hogger," shown at the left in the illustration, and the "Hy-Power," not shown, are both recommended for heavy-duty grinding.

These machines can handle work from 60 to 296 inches in length. Grinding wheel spindles 5 to 6 1/2 inches in diameter are mounted with heavy-duty taper roller bearings set in cast-iron housings. Motors for driving the segmental type grinding wheels range from 30 to 75 H.P., depending upon the work-piece capacity and production requirements. Table drives are hydraulically operated by dual cylinders. Specially designed mounting features eliminate piston sag, so that smooth operation of the work-table is assured. Table speeds range from 10 to 120 feet per minute and provision can be made for faster table speeds.

The "Hy-Power" shear blade and face grinder, not shown, is equipped with a 30- or 36-inch diameter heavy duty segmental grinding wheel chuck mounted on large diameter heavy-duty wheel supporting flange. The V-ways of the machine are 5 inches wide and the flat ways are 3 inches wide. Square (four sided), revolving knife bars are standard equipment with either 10- or 12-inch work faces available, and they are operated through a worm-gear mechanism which provides a full 360-degree adjustment. Large angle-plates for holding flat surface work-pieces are also provided. All knife bars are ground and balanced for accurate alignment. Clamping arrangements are available in manual, magnetic, hydraulic, or air-operated types to suit individual production requirements. The Hanchett "Big 60 Hogger," shown at the left in the illustration, is said to incorporate a new development by making use of a grinding wheel 60 inches in diameter of the periphery segmental type mounting which is made up of forty large abrasive segments with an alternate mounting arrangement, as shown in the view at the right of the illustration. Positive elimination of burning or checking of the work-piece is a feature claimed for this equipment.

These two grinding machines have a cross-feed mechanism using dual in-feed controls, both manual and automatic. Automatic in-feed is obtained by a hydraulically driven cam-operated device with graduated dial and can be adjusted from 0.00025 to 0.006 inch per table stroke. The motor-driven coolant systems are of large capacity, and the wheel guards are of heavy-duty boiler plate. Standard equipment includes dressing attachments. The machines weigh from 20,000 to 65,000 pounds, depending upon the sizes and capacities.

Circle Item 114 on postcard, page 257



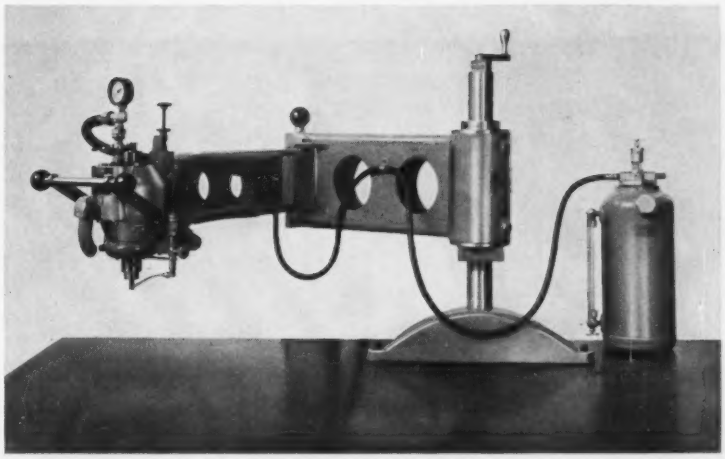
(Left) "Big 60 Hogger" shear blade and knife grinding machine brought out by the Hanchett Mfg. Co.; (Right) Segmental type wheel used on the machine shown at left.

Onsrud Radial Arm Bench Type Routing Machine

A radial arm bench type routing machine designed for rapid and accurate production work has been brought out by the Onsrud Machine Works, Inc., Chicago, Ill. Typical applications of this machine include edge trimming and cut-out operations on plywood, plastic and aluminum-alloy sheets.

The routing arm has a reach capacity sufficient to cover any point on a table within a radius of 44 inches from the center of the machine column. This W-106A machine is available with an Onsrud 1-H.P. motor having a speed of 22,000 R.P.M. and a 3/4-H.P. motor with a speed of 30,000 R.P.M.

The machine shown is equipped with a Norgren lubrication tank, hose, and fittings. Use of a coolant such as Cimcool is recommended when cutting aluminum to increase the life of the router bit and give a smoother cut. The routing machine is normally mounted directly on a table or bench top, where three bolts hold it in place. The unit weighs 200 pounds.



Onsrud radial arm bench type routing machine

Circle Item 115 on postcard, page 257

Baker Brothers Drilling, Boring, and Trepanning Machine

Variable speeds at constant horsepower, and the capacity for drilling, boring, and trepanning pieces from 6 to 60 inches in length are features of a two-way horizontal machine brought out by Baker Brothers, Inc., Toledo, Ohio. The power-driven unit at one end of the machine can be adjusted by a rack and pinion to accommodate work of different lengths. The two 25-H.P. motors have Reliance variable-speed drives that provide speeds of from 50 to 1700 R.P.M. with the full horsepower rating maintained throughout this range. In the high-speed range, the sheave drive is direct to the spindle and in the low-speed range it is through the back-gears.

Both power units have a stroke length of 40 inches and both are equipped with lathe type spindles to permit the chucking of either the work or tools. When used for trepanning, both the work and the tool rotate. Drills up to a diameter of 4 inches can be used. Coolant is piped through the hollow spindle at a pressure of 500 pounds per square inch. The machine is equipped throughout with automatic centralized lubrication. Cabinets for housing electronic controls, not shown, are mounted at each end of the two-way horizontal machine.

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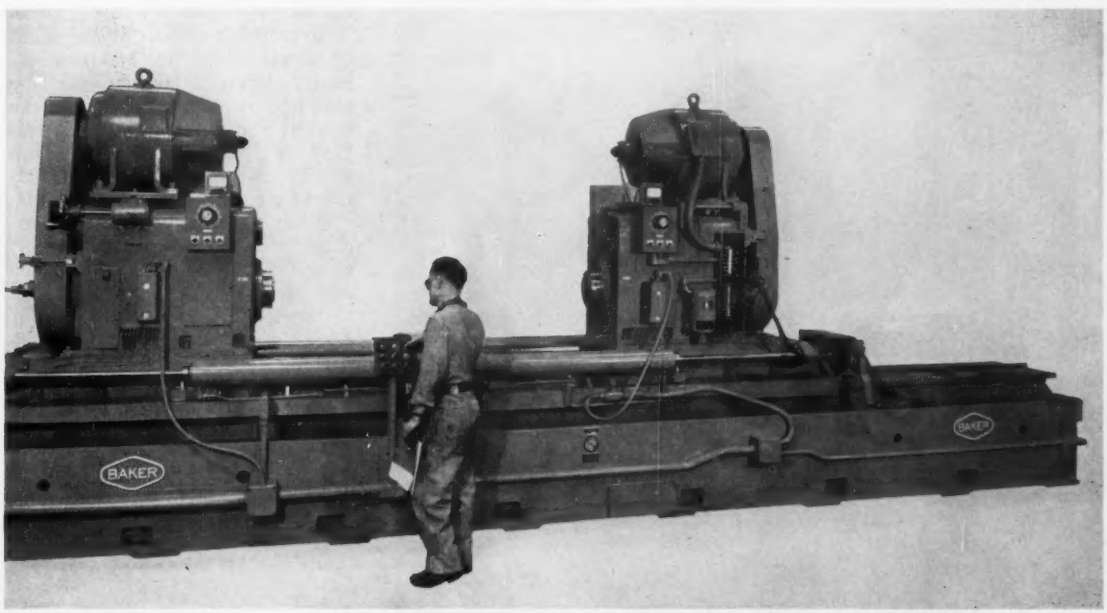
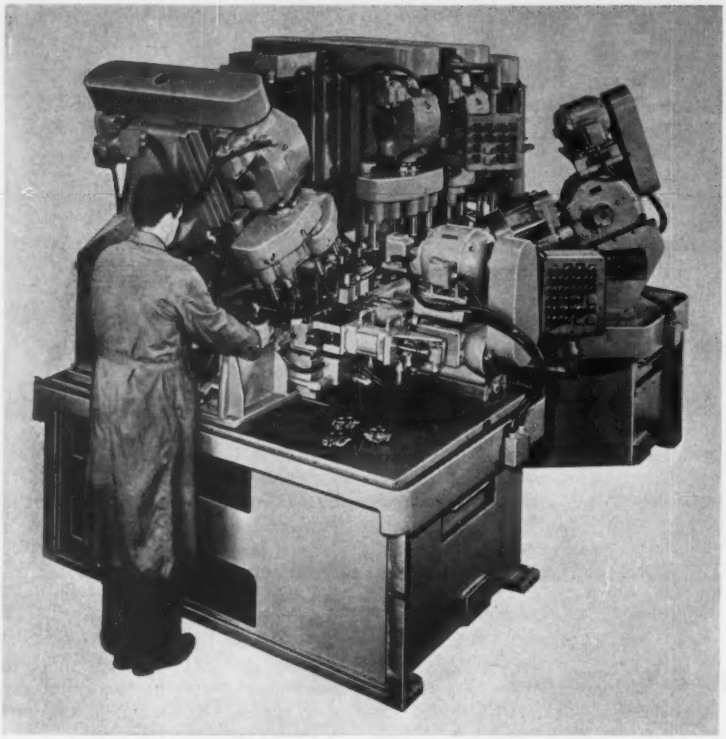


Drilling, boring and trepanning machine brought out by Baker Brothers, Inc.



Hartford single-purpose drilling and tapping machine

Single-Purpose Drilling and Tapping Machine

The Hartford Special Machinery Co., Hartford, Conn., has brought out a single-purpose drilling and tapping machine which has a production capacity of 450 carburetors per hour. This is an eight-station, multiple-spindle, dual-loading transfer type machine with five drill units, two tapping units and an air-hydraulic transfer mechanism. The parts ride free on rails between stations and are located and clamped at each station in previously machined valve holes.

Circle Item 117 on postcard, page 257

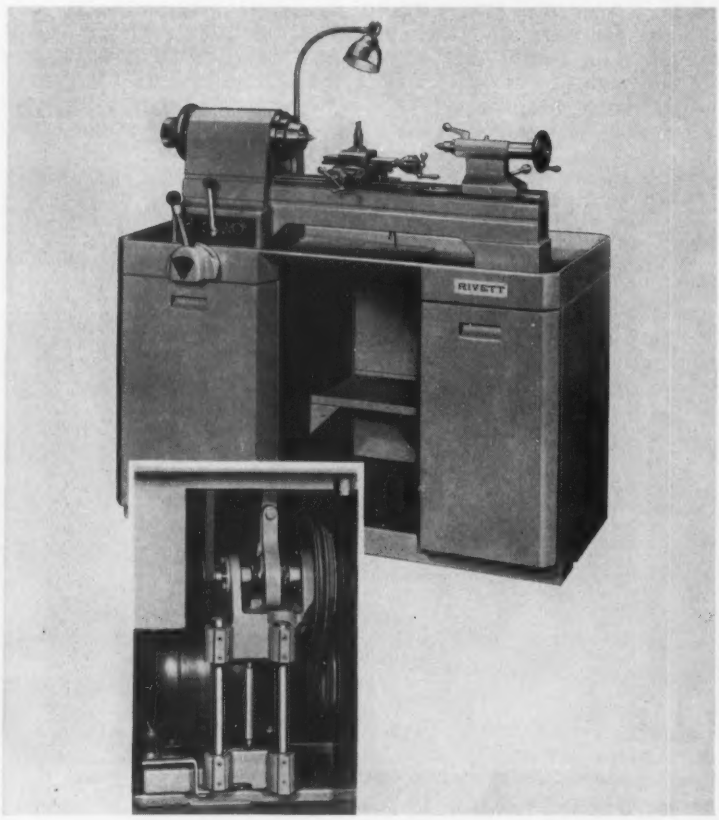
Rivett Precision Cabinet Lathe

An improved precision cabinet lathe designated Model 918 "Steelway" has been announced by Rivett Lathe & Grinder, Inc., Boston, Mass. This lathe has a swing capacity of 9 inches and is available either with a production drive that permits multiple functions to be controlled by one motion of the operator, or a variable drive for instant selection of any speed from 90 to 3750 R.P.M. The production drive is shown in the lower left corner of illustration.

Improved work-holding methods and well grouped controls for operator efficiency, greater capacity, and higher precision are features claimed for this new model lathe. A lever chuck closer reduces effort to a minimum; 1 1/8-inch capacity draw-in collets can be mounted directly in the spindle mouth; stationary collets have no "in" or "out" motion; and step chucks provide for accurate holding of circular or irregular parts.

Other distinctive features include: double-bevel steel-ways; a self-aligning slide-rest which squares itself automatically with the centers; an endless V-belt that can be easily replaced without disturbing the headstock and drive; headstock spindle which revolves on two super-precision, pre-loaded ball bearings; and wide spacing of 7 1/4 inches on ball centers to diffuse heat of end-thrust pre-load and provide better distribution of the radial load.

Circle Item 118 on postcard, page 257



Improved Rivett "Steelway" precision cabinet lathe and production drive

Machine for High-Temperature Testing

A machine designed for electrical measurement of both applied tensional loads and resulting specimen strain, based on SR-4 bonded resistance wire strain gage devices, is announced by the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. It is being used in the laboratory of the Universal-Cyclops Steel Corporation, Bridgeville, Pa., for tensional testing of "super alloys" at temperatures up to 2200 degrees F.

A specially designed rotary jig is employed in this machine to increase the frequency of tests at elevated temperatures. This jig carries eight electric furnaces in which test specimens can be heated simultaneously under independent automatic controls. Each furnace can be swung into the testing position while the temperature control is maintained.

Tension-compression cycling tests, a new feature in universal testing machines of this type, can be carried out at various temperatures using any two loads within the range of 50,000 pounds compression and 50,000 pounds tension.

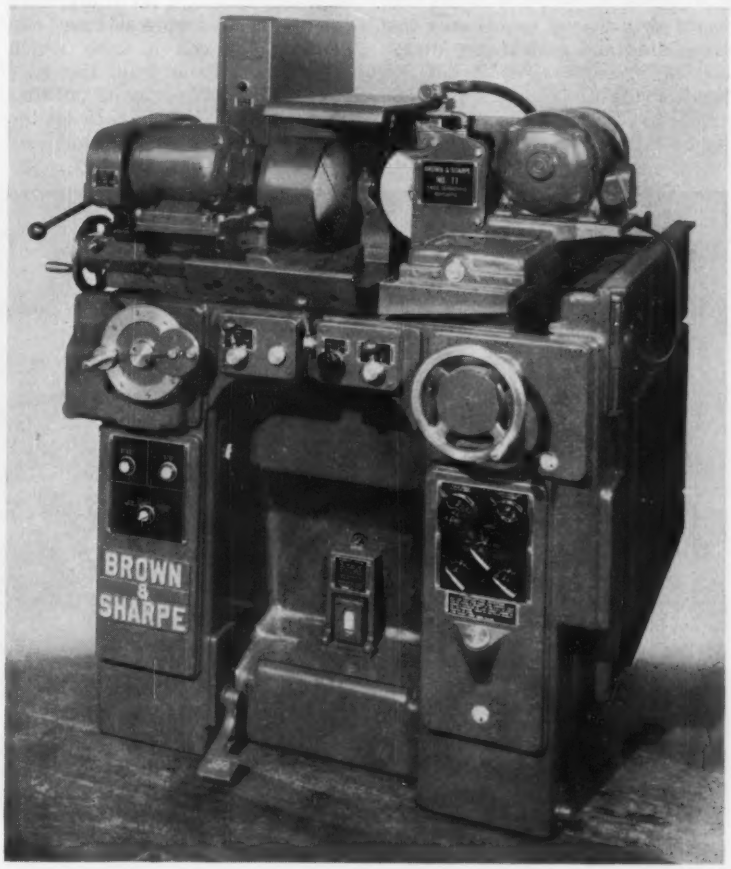
Circle Item 119 on postcard, page 257

Equipment for testing "super alloy" specimens at high temperatures

B & S Face-Grinding Machine

A No. 11 face-grinding machine with its work-spindle mounted in a horizontal plane so that a wide variety of work-holding devices can be used is announced by the Brown & Sharpe Mfg. Co., Providence, R. I. This machine is especially adapted for face grinding operations in the automotive, aircraft engine, gear, cutter, and tool fields where high surface-finish quality and precision are required. Rotation of the work in a vertical plane facilitates the cleaning of locating and clamping surfaces and the effective application of coolant, thus producing a high quality finish.

Accurate, flat surfaces can be ground on work up to 10 inches in diameter and up to 3 inches thick by mounting it on a permanent magnet chuck. The periphery of the wheel is then used for the grinding operation. Accurate, concave or convex surfaces up to a



Face-grinding machine brought out by the Brown & Sharpe Mfg. Co.

10-degree curvature can be easily ground.

Wheel truing is accomplished by the set-diamond method. During the truing operation, the position of the finished face of the work relative to the diamond remains unchanged. The horizontal work-spindle facilitates the use of lever-operated devices, such as the permanent magnet or face chuck.

The wheel-slide grinding and truing speeds are readily selected and set with the aid of a graduated dial which indicates the speed in use. The same facilities are provided for the work feed. A positive stop designed to insure accurate sizing provides for both manual and power feed of the work-head. Other features include choice of manual or semi-automatic control, accurate reversal of the wheel-spindle slide, sealed lubricated spindles and automatic lubrication.

Circle Item 120 on postcard, page 257

Monarch "Preselector" Dyna-Shift Lathe

The Monarch Machine Tool Co., Sidney, Ohio, has announced a Series 62 "Preselector" Dyna-Shift lathe in which speed pre-selection has been combined with the Dyna-Shift headstock incorporated in the Series 90 heavy-duty lathe recently introduced by the company. Incorporation of the speed pre-selection feature with the Dyna-Shift headstock is said to make savings in machining time possible, especially when frequent changes in work diameter occur.

This lathe will be offered in four models, all with a 20-H.P. main-drive motor. The Model 130 has a swing of 13 inches over the cross-slide and a clearance diameter of 20 inches. The Model 131 has a swing of 16 inches over the cross-slide and a clearance diameter of 24 inches.

Models 1130 and 1131 are provided with more accessory equipment for the greater flexibility desired in tool-room work. On Models 130 and 131 reversal of the lead-screw is accomplished by means of a lever at the front of the headstock. On Models 1130 and 1131 it is achieved through a design of apron controlled reverse which speeds up thread-chasing.

The Preselector Dyna-Shift controls, Fig. 2, have been incorporated in the front of the headstock. They consist of a surface-speed setting dial, a work-diameter setting dial, a set of diameter pre-selectors, a spindle speed indicator dial and a knob which frees the spindle from the gear train. With these controls, all that an operator has to do is to set the dials for work diameter and surface feet per minute required. The Dyna-Shift then computes the speed and makes the shift automatically and hydraulically to give the correct spindle speed at which to operate.

The surface speed may be maintained on succeeding diameters of the work by setting up the values of the latter on the numbered, adjustable work-diameter selectors provided with the new Preselector control. Every speed change thereafter, on every piece in the run, takes place automatically with but one fast dial setting and movement of the work start-and-stop lever which is on the apron.

For set-up purposes, there is a second work start-and-stop lever at the headstock end of the machine. These levers have three positions designated "run," "brake," and "jog." There is fingertip shifting from one position to another because clutching, braking and jogging are all accomplished hydraulically with the levers serving simply to open valves.

When the first cut is finished, the work lever is moved to its "speed change" position. Immediately, the Dyna-Shift mechanism automatically makes the shift required to provide the speed which has been pre-selected for the next diameter. The operator then moves the lever to the "run" position and work rotation resumes at the new speed. The cor-

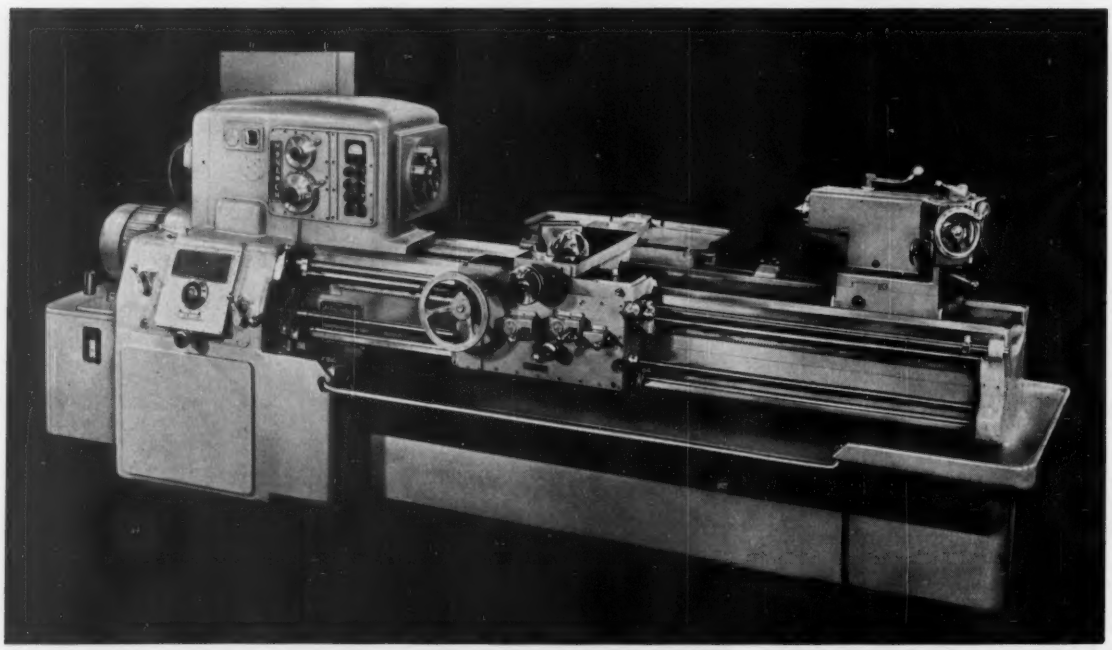


Fig. 1. Preselector Dyna-Shift lathe introduced by the Monarch Machine Tool Co.

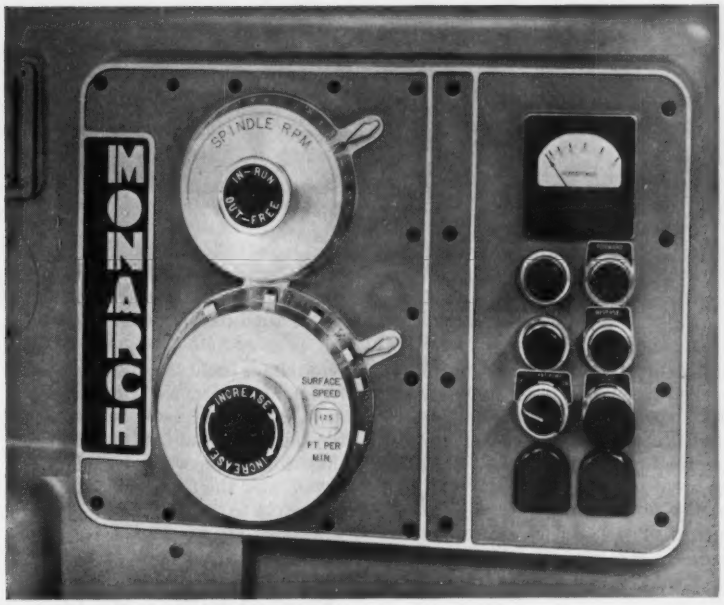


Fig. 2. Close-up of controls on Monarch lathe shown in Fig. 1

rect speeds for each of the remaining diameters on the work-piece are obtained in the same manner.

The pre-selection feature permits increasing or decreasing the speed at will as operations progress. However, once the diameter pre-selectors have been set for a given work-piece, as many of these pieces can be turned as desired without further thought being given to the speeds to be used.

There are thirty-six spindle speeds in a range from 14 to 1750 R.P.M. (a ratio of 1 to 125) in the new lathe. The different operations of the Series 62 headstock are completely interlocked so that it is impossible to cause damage to the machine. Although the operator may pre-select a new speed while the spindle is rotating, it is impossible for the shift into the new speed to take place until spindle rotation has stopped.

Lubrication of all headstock gears and bearings is through a high-pressure mist system. The drive to the headstock is through multiple V-belts. The motor, mounted on the outside of the machine for easy maintenance, can be moved vertically for adjustment of V-belt tension. Four-way rapid traverse, in addition to the usual power controls at the lathe apron, is supplied for both carriage and cross-slide to assist in rapid tool positioning, quick tool retraction and fast carriage return.

The tailstock has a slow speed for drilling, and a fast speed for traversing the spindle into position. All electrical controls are located at the front of the headstock to facilitate operation.

Circle Item 121 on postcard, page 257

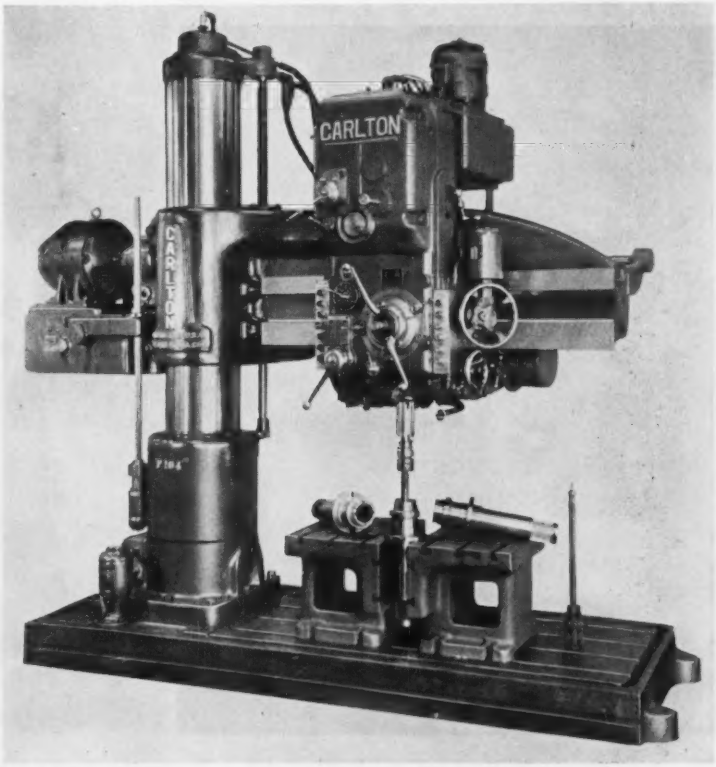
Radial Drilling Machine with Honing Attachment

The Carlton Machine Tool Co., Cincinnati, Ohio, has built and equipped a 5A radial drill with a honing attachment for installation in the East Pittsburgh Works of the Westinghouse Electric Corporation. This machine will be used for conventional drilling and for honing operations which involve the use of drill jigs and miscellaneous equipment. Operations are regularly performed on holes from 2 to 5 inches in diameter but provision can be made to handle work with smaller and larger holes.

The machine can be used to hone either blind or through holes. The stroke capacity ranges from 5 to 24 inches. Although only a 12 to 15 micro-inch finish is required on the work illustrated, it is possible to hold the finish within 1 micro-inch r.m.s.

Tolerances on diameters are held to size within 0.0002 inch. Coolant for the hone is housed in a special tank that is separate from the lubricant used for conventional drilling. One set of honing stones usually lasts for an average of twelve holes.

Circle Item 122 on postcard, page 257



Carlton radial drilling machine with honing attachment

Shearcutter Taps for Metric Threads

Standardized taps for metric threads in all sizes and pitches are now being produced in the United States as a stock item by the Shearcut Tool Co., Reseda, Calif. These taps are being manufactured especially for use in servicing the thousands of foreign automobiles and machine tools imported by this country.

As the illustration shows, these taps are made with high-spiral flutes, a design originated by the manufacturer several years ago. The high-spiral flutes and cutting edges, and the lower torque requirements are said to give the taps a longer, useful life, permit higher speeds, and reduce costs. The taps are made from the finest high-speed steel and are ground from the solid after hardening.

Circle Item 123 on postcard, page 257

Tap for metric threads made by the Shearcut Tool Co.

Inverted Mechanical Presses for Resistance Electric Welding

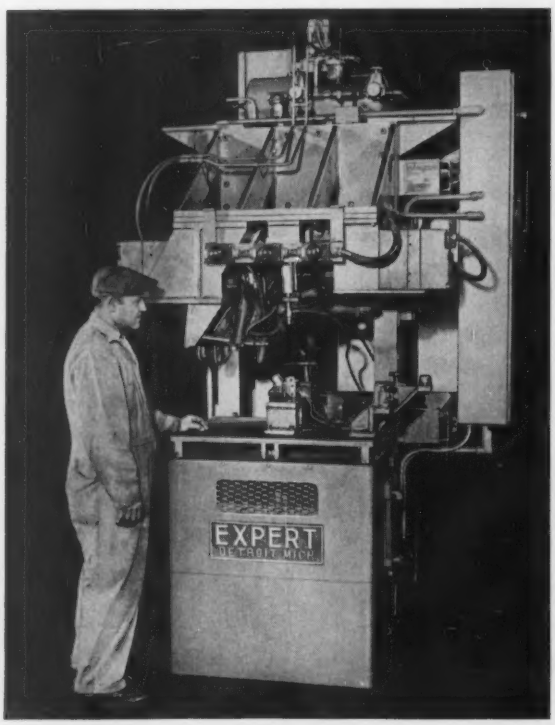
A line of compact, low-tonnage inverted mechanical presses designed for a wide variety of spot and projection resistance welding operations is now available from the Expert Welding Machine Division, Detroit, Mich. The machines are made in a line of 32-, 42-, and 60-inch models, each having adjustable strokes of 5, 6, and 8 inches. The rated capacity of the presses is about 2 tons and the operating speed 2200 strokes per minute.

When the operator simultaneously depresses interlocked cycle start buttons with each hand, the brake in the mechanical knee is released and the platen rises to the top dead-center position where the brake is again applied. Then a limit switch is tripped, and the welding guns are brought in. The weld timer controls the squeeze, weld and hold cycle, the guns retract, and the platen returns to the bottom dead-center position. Then the finish-welded part is removed, and the fixture loaded with new parts to be welded.

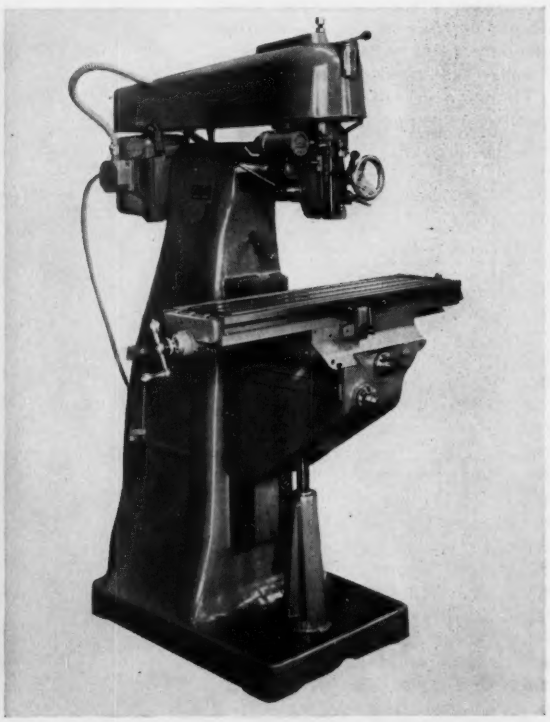
Circle Item 124 on postcard, page 257

Vertical Milling Machine with Power Feed Head

A vertical milling machine equipped with a power feed head is being built by the U. S. Burke Machine Tool Division, Cincinnati, Ohio. The head of this machine has an infinitely variable power feed ranging from 0.002



Inverted mechanical press for resistance welding built by Expert Welding Machine Division



Power feed head vertical milling machine brought out by the U. S. Burke Machine Tool Division

to 0.008 inch per revolution. The feeding rate can be easily varied while the machine is in operation. The power quill has a travel range of 5 1/2 inches, is completely enclosed, and is hard chromium-plated. The quill has a downward thrust of 800 pounds.

Six spindle speeds ranging from 250 to 2850 R.P.M. are available when the machine is equipped with a 1-H.P. motor operating at an output speed of 1150 R.P.M. When a Lima drive motor is used, twenty-four spindle speeds are available ranging from 65 to 2850 R.P.M. The work surface of the table is 9 1/2 by 36 inches, and has a longitudinal feed of 24 inches. The machine requires a floor space of 60 by 75 inches, and weighs 1600 pounds.

Circle Item 125 on postcard, page 257

Conveyorized Grinding, Polishing and Deburring Machine

The Curtis Machine Corporation, Jamestown, N. Y., has announced the production of a small conveyorized all-purpose grinding, polishing and deburring machine. This bench type, abrasive-belt machine handles all types of material.

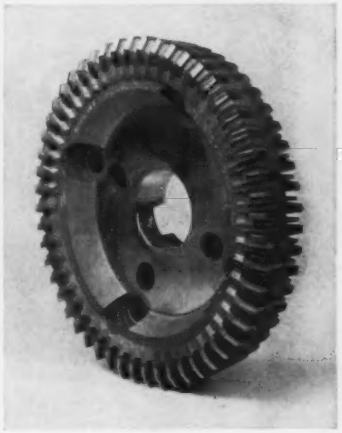
The conveyor belt is driven by an infinitely variable speed, 3 to 1 ratio, 1/3-H.P. motor which provides the flexibility required for various types of work. The coated abrasive belt, under spring tension, is driven by a 1 1/2-H.P. motor which has a speed of 3600 R.P.M. The 4-inch wide, 54-inch long belt can be changed in a few seconds. A handwheel at the front of the machine adjusts the grinding head for variations in stock thickness and regulates the grinding pressure. Multiple grinding heads adapted for rough- to finish-grinding operations can be provided.

Circle Item 126 on postcard, page 257

Roughing Cutter with Carbide-Tipped Blades

A "Shear Clear" face-milling cutter with extra close spacing of its carbide-tipped blades has been developed by the Ingersoll Milling Machine Co., Rockford, Ill. The combination of design features and material used in the manufacture of these cutters is said to have increased their life from 75 to 100 per cent and made extremely high feeds possible.

This roughing cutter has five carbide-tipped blades per inch of diameter. It is manufactured in diameters from 4 inches up, and is intended especially for milling cast iron at high feed rates.

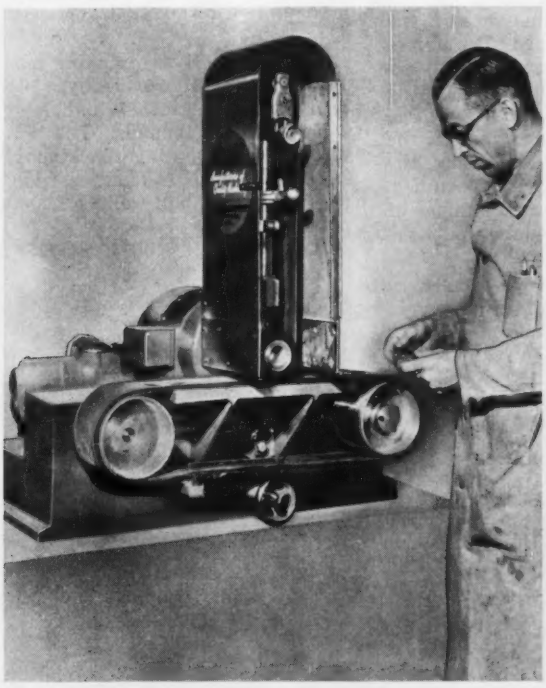


Ingersoll milling cutter for fast-feed roughing cuts

Circle Item 127 on postcard, page 257

Welder for Joining Metal Sheets from One Side of Work

A spot arc-welding unit has been placed on the market by the Mid-States Welder Mfg. Co., Chicago, Ill., for sheet-welding appli-



Conveyorized grinding, polishing and deburring machine made by Curtis Machine Corporation

Spot arc-welding unit for joining metal sheets developed by Mid-States Welder Mfg. Co.

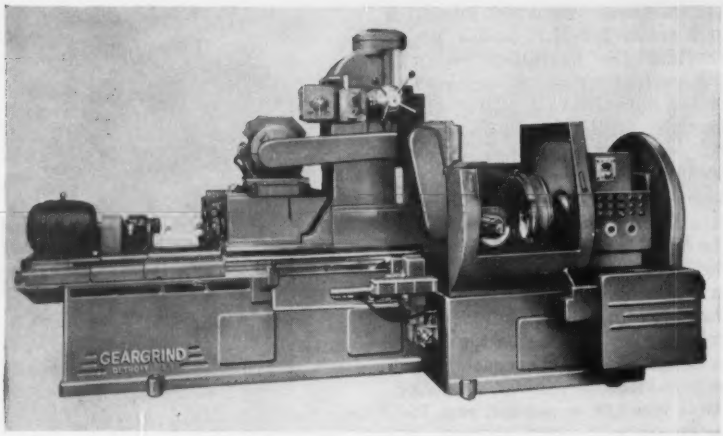


Fig. 1. Internal gear grinding machine announced by Gear Grinding Machine Co.

cations where it is possible to work from one side of the sheet only. The welding arc is formed between the tungsten electrode and the work-piece while shielded by an inert gas atmosphere. A self-timing device eliminates the danger of burning through the metal. As this process is repeated, it forms a series of puddles or spots.

By a flip of a switch, the machine can be converted to operate as a Heliarc welding unit and, if desired, the unit can be used for ordinary metallic arc-welding. Equipment includes gas controls, self-timer, heavy-duty magnetic contractor, and remote control circuit. The welder operates on any alternating current and welding power source of approximately 300 amperes capacity.

Circle Item 128 on postcard, page 257

Internal and External Gear Grinding Machines

The Gear Grinding Machine Co., Detroit, Mich., has just announced the 30-inch internal and 36-inch external gear grinding machines shown in Figs. 1 and 2. These machines are of the automatic form-grinding type and are designed for production grinding of splines, and specially contoured parts, as well as gears. Helicopter rings, gas turbine compressor drive-shafts, turbo compressor drive-shafts, turbo propeller blade shanks, tank drive gears, locomotive drive gears, and gears for gun-training mechanisms are typical of the many parts which can be handled by these machines.

One feature of the machines is the ease with which they can be set up or retooled for another job. Generally, the only changes required in setting up for a new part are in the contour forms, index-plates, and holding fixture or arbors.

When these machines are in operation, the grinding wheel reciprocates across the face of the work with a stroke that is just long enough to clear the cut. At each reversal point, the grinding wheel is fed downward a predetermined amount. Grinding in one tooth space continues until the rough size is reached. The grinding wheel then travels on an extended stroke, so that it clears the work to permit indexing. The grinding wheel is then reset to the upper starting position and the tooth grinding cycle continued. After a predetermined number of teeth have been roughed out, the grinding wheel is automatically traversed to the trim position. All of these operations are performed automatically, and adjustments for the number of teeth ground before trimming, the total down feed, as well as the number of cuts, are variable over a wide range.

After the work is completely roughed out, the machine stops at the trim position. The grinding wheel is dressed and the operator manually feeds the wheel for finish-grinding. During the finish-grinding operation, indexing occurs after each reciprocation of the grinding wheel.

In some instances, where the tolerances permit, the work is ground to the finish size in one operation. The grinding wheel column which carries the wheel-head is mounted on the reciprocating carriage. The carriage slides on the base ways and is driven by a hydraulic cylinder. In the case of the internal gear grinder, Fig. 1, the work is mounted in a fixture secured to the work-head spindle. Indexing is accomplished by a system having a single-gash index-plate for locking the work. The required index motion is determined by a change-gear arrangement. In the case of the external gear grinding machine, the work can be held on an arbor or chuck secured to the work-head spindle or mounted on an arbor between centers.

The internal gear grinding machine is 196 inches long, 100 inches wide, 96 inches high, and weighs 30,000 pounds. The external gear grinding machine is 201 inches long, 100 inches wide, 96 inches high, and weighs 23,000 pounds.

Circle Item 129 on postcard, page 257

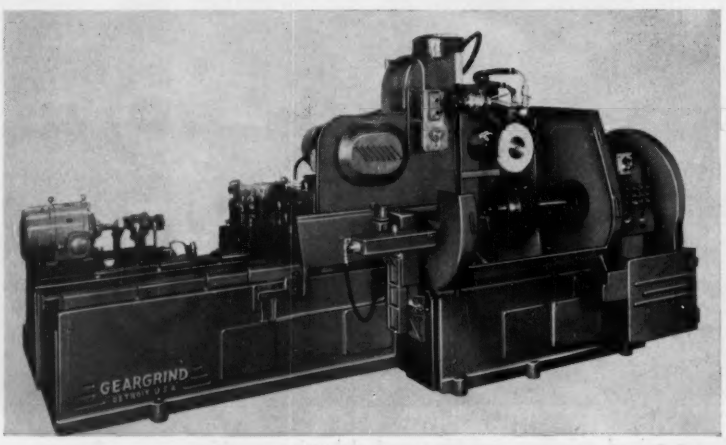
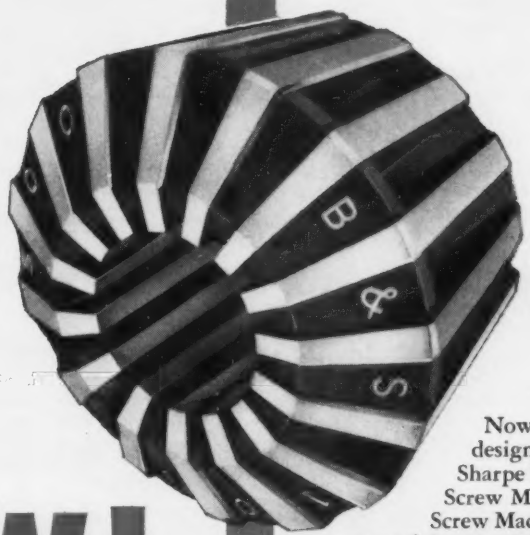


Fig. 2. External gear grinding machine built by Gear Grinding Machine Co.

Sensational Advance in Screw Machine Tools!

- Give more powerful, more uniform grip
- Maintain uniformly high concentricity
- Cut collet inventories as much as 65%



Each collet covers a .050" range.

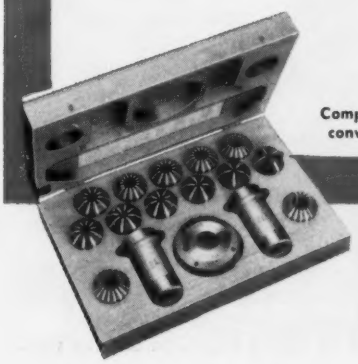
NEW!

Rubber-Flex* Collets for Brown & Sharpe Screw Machines

Now, revolutionary Rubber-Flex design brings to users of Brown & Sharpe No. 0 and No. 0G Automatic Screw Machines and the No. 0 Hand Screw Machine a collet with a far more powerful, more uniform grip than conventional spring-type collets! What's more, these new collets cut inventories to the bone. Each collet has a nominal range of .050". A set of only 13 will cover the spindle capacity of any of the above machines from .100" to .750"!

In a Rubber-Flex Collet, steel inserts permanently bonded to rubber, hold the stock firmly . . . automatically "tighten" their grip as the power of a cut increases. The inserts have uniform hardness . . . give long wear under rugged conditions. In operation, the unusually high concentricity of a Rubber-Flex Collet assures top accuracy on the finest work. And collet faces seal flush against the chuck nut . . . protect the spindle unit from chip-laden coolant.

Get the outstanding benefits of Rubber-Flex Collets on all your round stock jobs — and on second operation work where the piece utilizes the full bearing surface of the collet. Available singly or in sets. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



Complete sets available in convenient, sturdy boxes.

*Rubber-Flex is a trade-mark of the Jacobs Manufacturing Company who makes these collets for us.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S **Brown & Sharpe**

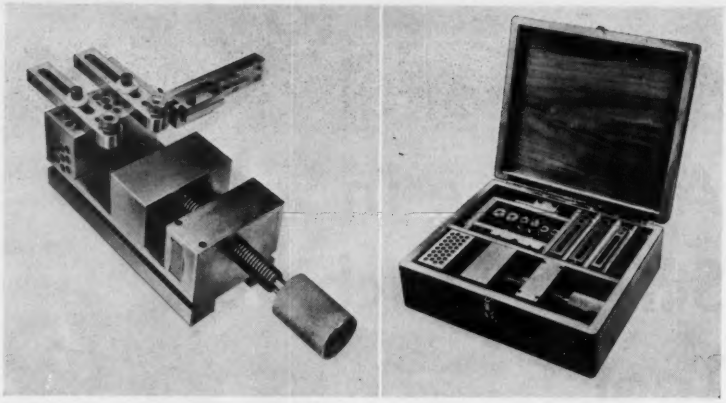
Dual-Purpose Jig-Vise

A jig-vise designed to serve as a universal drill jig and also as a precision grinder vise has been developed by the Rynd Tool Co., Inc., Meadville, Pa. This work-holding device is intended for use in tool-rooms and job shops, and is built to handle production as well as short-run work. The view at the left in the illustration shows a set-up with two precision-located drill bushings and work-stop. The view to the right shows the hardened and ground vise and the regularly furnished accessories.

With this device, scribing and center-punching operations are eliminated and one or a hundred pieces can be drilled within accuracy limits well under 0.001 inch in less time than by the former method. When this device is used for precision grinding, work can be held to limits of 0.0003 inch.

The hardened and ground jaws are 1 3/4 by 3 inches and have a maximum open capacity of 4 inches. The accessory equipment includes an adjustable stop-rod assembly, precision-hardened and ground V-block, two pairs of bushing bars, three pairs of precision dowels, three pairs of bushings for 1/8-, 5/16- and 7/16-inch drills, and screws, washers, and wrenches.

Circle Item 130 on postcard, page 257



Rynd jig-vise for precision drilling and grinding work

Vacu-Blast Metal-Cleaning Equipment

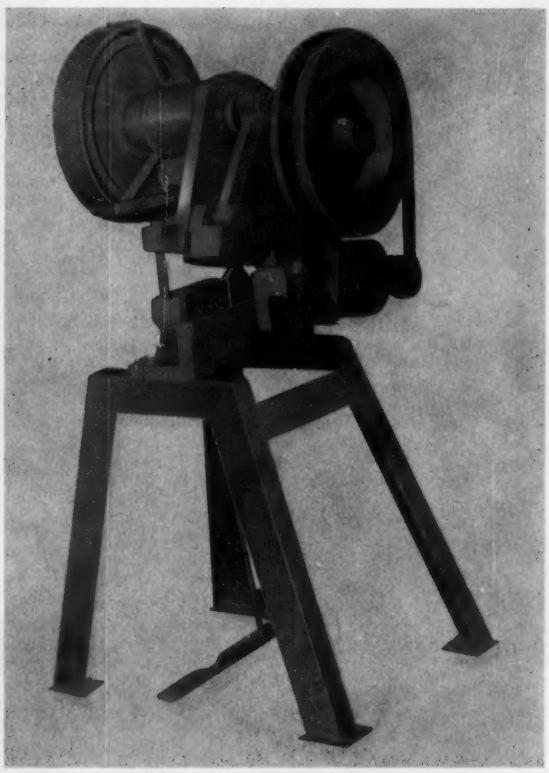
An intermediate-sized "Utility" metal-cleaning machine announced by the Vacu-Blast Co., Inc., Belmont, Calif., is designed for faster cleaning rates than the Vacu-Blast and Junior models previously introduced. This machine is used for plant maintenance, for cleaning metal before and after welding, for removing rust and paint, and for use in etching calendar rolls.

Circle Item 131 on postcard, page 257

Bateman Power Shear

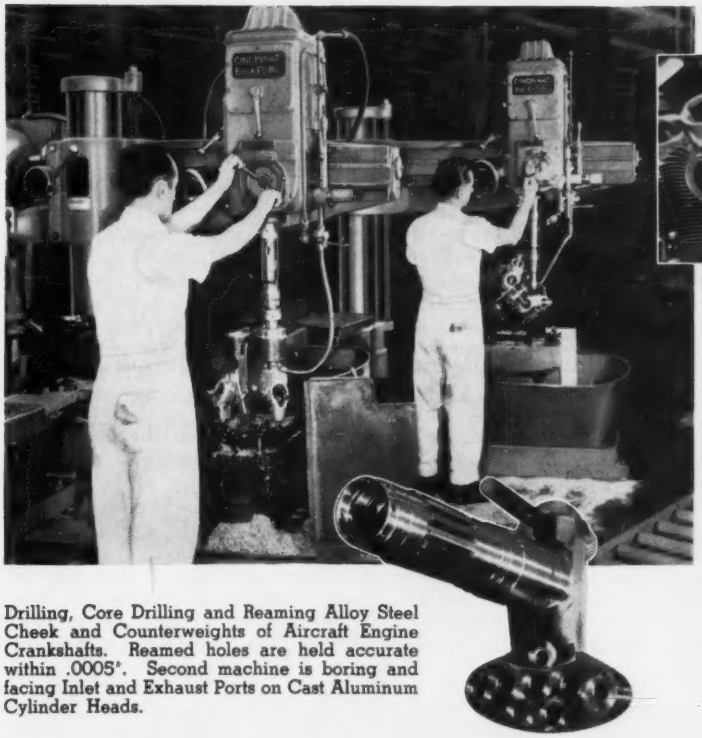
A shear designed to cut off small angle-iron stock in sizes up to 2 by 2 inches by 3/16 inch, and flat

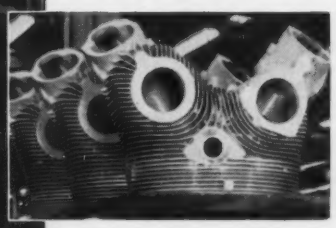
Vacu-Blast "Utility" model metal-cleaning equipment



Bateman power shear for cutting angle-iron and flat stock

Cincinnati Bickford MEETS ALL REQUIREMENTS AT Canadian Pratt & Whitney Aircraft Company LIMITED





Drilling, Core Drilling and Reaming Alloy Steel Cheek and Counterweights of Aircraft Engine Crankshafts. Reamed holes are held accurate within .0005". Second machine is boring and facing Inlet and Exhaust Ports on Cast Aluminum Cylinder Heads.

Drilling, Counterboring, Reaming and Tapping 1¾" Hole in Aluminum Crankcase Forging Section to a tolerance of ±.001".

Six Cincinnati Bickford 9″ column Super Service Radial Drills have given a fine performance and established a record for accuracy and reliability, and have met production problems at Canadian Pratt & Whitney Aircraft Co., Ltd. Modern Cincinnati Bickford features for convenient easy handling, power and speed have made these machines highly profitable. Investigate these money makers.

Write for Bulletin R 21C.

Photos courtesy of Canadian Pratt & Whitney Aircraft Co., Ltd., Montreal, Canada.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

stock up to 1/4 inch by 4 inches is being placed on the market by the Bateman Foundry & Machine Co., Mineral Wells, Texas. The clutch is put into action either by hand or foot. By opening the clutch the machine can be operated at the rate of 44 strokes per minute. It is equipped with a flywheel and gear drive for power operation by a 3/4-H.P. motor and requires a floor space 24 by 27 inches. The height from floor to top of machine is 56 inches.

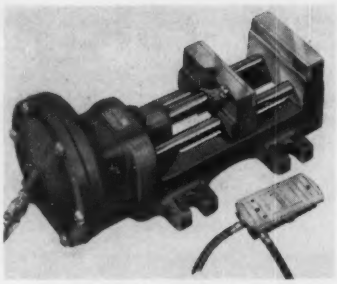
Circle Item 132 on postcard, page 257

Compact Dust Exhauster

The Abrasive Machine Tool Co., East Providence, R. I., is manufacturing a compact, self-contained dust exhauster called the "Feifel Dustsnaire." This unit is guaranteed to remove all particles above 5 micron grain size having a specific gravity of 1.5 or higher. The only maintenance required by the unit is the removal and emptying of the large dust pan located in its base.

The dust exhauster occupies less than 4 square feet of floor area, and is approximately 4 feet high. It is easily portable and can be moved quickly from one grinder to another. Its rated capacity is 309 cubic feet of air per minute.

Circle Item 133 on postcard, page 257



Heinrich air-operated vise

Heinrich Air-Operated Vise

Heinrich Tools, Inc., Racine, Wis., has announced the addition of a Model 44 air-operated vise to the company's line of work-holding equipment. This vise has a gripping force fifteen times the air line pressure and is furnished with jaws having a width of 4 inches. The clamping jaw is infinitely adjustable to a maximum opening of 4 1/2 inches and has a maximum travel of 3/8 inch. The vise is operated from either an air line or compressor at a maximum pressure of 150 pounds per square inch.

The air vise is controlled by a foot-pedal which leaves the worker's hands free for rapid insertion or removal of work-pieces. The vice jaws can be kept open or closed without constant application of foot pressure. The sliding jaw is mounted on two hardened and ground parallel bars which maintain accurate alignment with the fixed jaw. The vise is equipped with one set of removable soft steel recessed parallel false jaws. Straight jaws are also available.

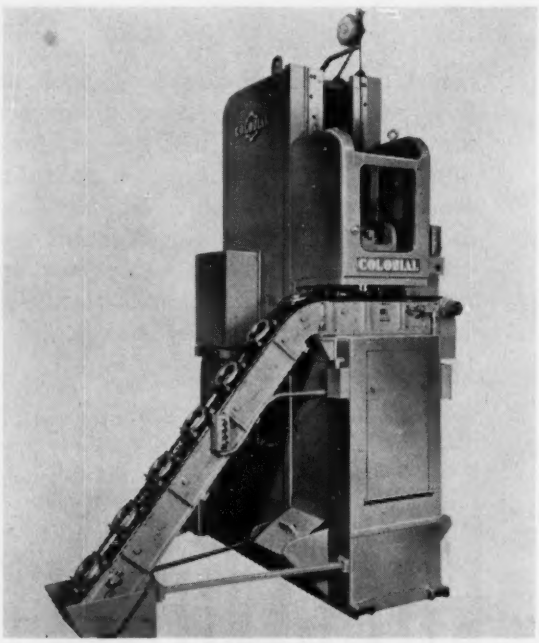
Circle Item 134 on postcard, page 257

Colonial Broaching Machine with Loading and Unloading Conveyor

Automobile differential ring gears are being broached at the rate of 300 per hour on a pull-up type machine equipped with an automatic loading and unloading conveyor developed by the Colonial Broach Co., Detroit, Mich. This 15-ton machine has a 48-inch stroke. The automatic, chain type loading fixture permits loading gear blanks from the floor level. Normally, broaching machines with the capacity of this Model RU-15-48 must be operated from a platform, or set in a pit to permit floor-level operation.

One advantage of this method of loading is the freedom it offers the operator in keeping the machine loaded with blanks. It is not

Dust exhauster of self-contained compact design manufactured by the Abrasive Machine Tool Co.

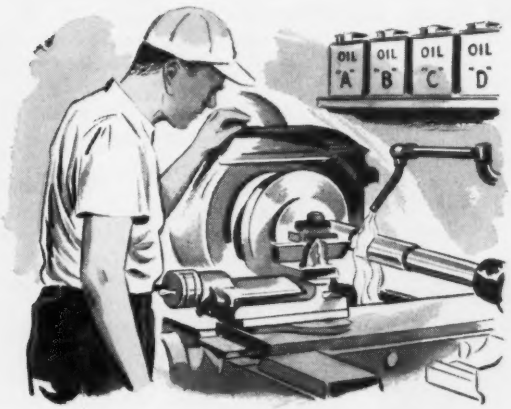


Colonial pull-up broaching machine equipped with an automatic loading and unloading conveyor.

How to Pick the Right Cutting Oil

WORD OF MOUTH?
It gives you the answer sometimes, but not many of your friends have the same cutting oil requirements and the same problems that you have. It's much surer to depend on specialists like Sun.

LABORATORY ANALYSIS?
Sure. But there's no formula for correlating the laboratory analysis with how well the cutting oil will work on your job. It takes years of field experience like Sun's to help you make the right choice.



ELABORATE SHOP TEST?
This will probably give you the answer. But it's expensive and interferes with production when you try to test all the oils available. Sun's experience can help keep your shop-testing to a minimum.

EXPERIENCE IS THE ANSWER.
And Sun has it. Its field representatives have probably come across problems similar to yours many times. If they haven't, its cutting oil specialists and metallurgical technicians are ready to help with your problem.

Soluble or straight, transparent or black, light or heavy duty — Sun makes the kind of cutting oil you need to handle your job at the lowest cost. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-4

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

necessary for him to stand next to the broaching station continuously to insure that 100 per cent cycling efficiency is maintained. Several blanks can be loaded into the conveyor at one time, thereby "breaking the loading routine" and freeing the operator for other duties.

Twenty-two identical locating fixtures and twenty-two broach-return gaps are spaced alternately along the double-chain loading conveyor. The conveyor is driven hydraulically and indexed every half machine cycle—once for the cutting stroke, and once for the broach-return stroke. Broached blanks are unloaded by gravity as the conveyor sweeps around the sprockets at the unloading station. All hydraulic and electrical circuits are interlocked for both timing and safety.

Circle Item 135 on postcard, page 257

HIGH SPEED AIRCRAFT EXTENSION AND THREADED SHANK DRILLS
AIRCRAFT EXTENSION DRILLS
WITH SPRING TEMPERED SHANKS
6 INCH OVERALL LENGTH
12 INCH OVERALL LENGTH
THREADED SHANK AIRCRAFT DRILLS
1⅞ INCH OVERALL LENGTH
1 INCH OVERALL LENGTH
PLAIN THREADED SHANKS
1⅞ INCH LONG UNDER THREADS
1 INCH LONG UNDER THREADS
ADAPTER TYPE THREADED SHANKS WITH 5/16" HEX

Whitman & Barnes high-speed extension and threaded-shank drills

Whitman & Barnes High-Speed Drills

A line of extension and threaded-shank drills is being introduced by Whitman & Barnes, Plymouth, Mich., for use where drilling operations on aircraft bodies cannot be performed with drills of regular length. Extension drills of this new line are ordinarily made in 6-inch and 12-inch lengths. Shanks are spring-tempered to prevent bending and breaking. All sizes have flutes of the same lengths as the equivalent sizes of Jobbers', wire-gage and letter-size drills.

The threaded-shank drills of this line are designed for use in close quarters, and in angle and flexible shaft drives. Separate adapters are required for plain-threaded shank drills, but on the hexagonal type of shank, the adapter is an integral part of the drill. Thread sizes are 5-40, 10-32 and 1/4-28. Drills are made in two lengths—short series and long series. Sizes range from 1/16 to 3/8 inch; No. 1 through No. 50 wire gage; and "A" through "W" letter sizes.

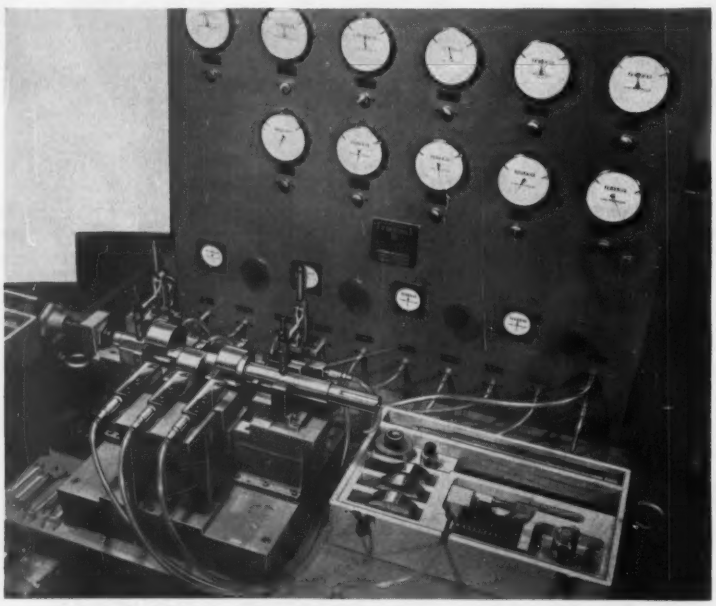
Circle Item 136 on postcard, page 257

Air Gage for Checking Refrigerator Compressor Crankshafts

A multi-station Dimensionair gage, which checks eleven separate dimensions on refrigerator compressor crankshafts for commercial air conditioning units, has been developed by the Federal Products Corporation, Providence, R. I. This gage is equipped with six fixed, jetted air snaps which measure the diameters of the bearing journals and cams. After these diameters have been checked, a positioning device moves the crankshafts to the right where an axis is established by the gaging vee, so that the throws can be measured with the new Federal AirProbe.

While the crankshaft is in the second position, another AirProbe, which is mounted on a free-floating motion transfer unit, checks the squareness of the thrust face with the bearing journals. The final measurement, the end diameter of the shaft, is taken with a regular Federal portable air snap gage.

Circle Item 137 on postcard, page 257



Federal multi-station Dimensionair gage for checking refrigerator part

(This section continued on page 242)

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Performs 23 operations every 18 seconds on automotive intake manifold!

This Buhr 5-way dial-type hydraulic-feed Special mills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross.

The Machine is equipped with a Buhr 60″-diameter 6-position automatic index table, complete with shot bolt.

Chips are disposed automatically by means of a rotating chip conveyor.

Parts are loaded one per station in each of the six single-place fixtures. Power wrench with torque-control, automatically operates clamping mechanism.

Buhr's precision manufacturing methods provide complete interchangeability of all parts and component assemblies.

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.©
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

Sidney Lathes

INCREASE LIFE OF CARBIDE TOOLS

The continuous tooth contact of Sidney's All-Herringbone Geared Headstock produces a smooth flow of power and creates pressure of constant intensity on the cutting tool . . . This constant pressure is especially desirable when using carbide tools by preventing tool breakage caused by shock or intermittent pressures.

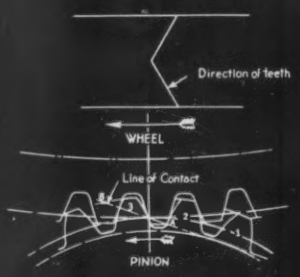


FIG. 9
VIEW IN PLANE OF ROTATION

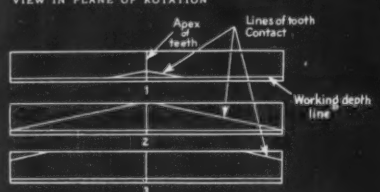
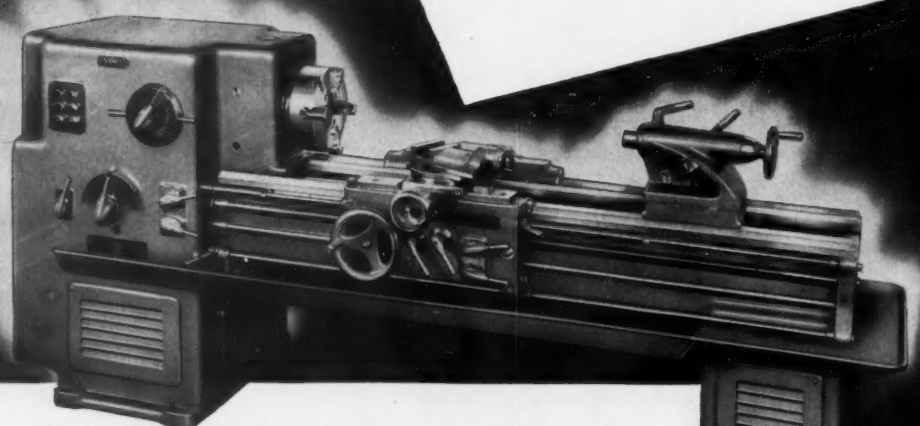


FIG. 10
DEVELOPMENT OF TEETH IN CONTACT.

Illustrated at left is the nature of contact between two herringbone gears. Pressure is evenly divided over three teeth with no tendency for tooth contour to wear unevenly. Full descriptive bulletin available.



SIDNEY MACHINE TOOL COMPANY

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For more information on products advertised, use Inquiry Card, page 257

AMERICAN STANDARD BUTTRESS SCREW THREADS—8

Appendix C—Pitch Diameter Measurement*

Wire Sizes (*Continued*). The distance j that the contact point on the trailing flank will be below the pitch line is computed by the formula

$$= \frac{H}{2}\left(\frac{\text{sec 45 deg.} - \text{sec 7 deg.}}{\text{sec 45 deg.} + 2\ \text{sec 7 deg.}}\right)$$

The value for j is $0.05281p$ and the diameter of the "best size" wire is determined by substituting this value for j in the following formula:

$$w\ \text{(best size)} = 2\left(\frac{H}{2} - j\right)\text{sec 45 deg. tan 26 deg.} =$$

$$2\left(\frac{H}{2} + 2j\right)\text{sec 7 deg. tan 26 deg.} = 0.54147p$$

This wire will contact the pressure flank at a point $2j$ above the pitch line and the effect on the computed pitch diameter caused by an error in the angle of one flank of the thread will be approximately the same as for an error of the same magnitude on the other flank.

As shown in Fig 3, the "best size" wire will contact the pressure flank of a thread of basic form at a point $0.1944p$ below the thread crest and the wire will project above the crest $0.1094p$. If this wire fails to project above the crest of thread, a larger wire must be used. For such a case, the maximum wire $0.61433p$ which contacts the trailing flank at the pitch line should be used. The relation of the "best" and "maximum" size wires to the flanks and crests of the 7 deg., 45 deg. buttress thread is shown in Fig. 3. The diameters of "best" and "maximum" wires and the projection above the crest of the thread are shown in Table 5.†

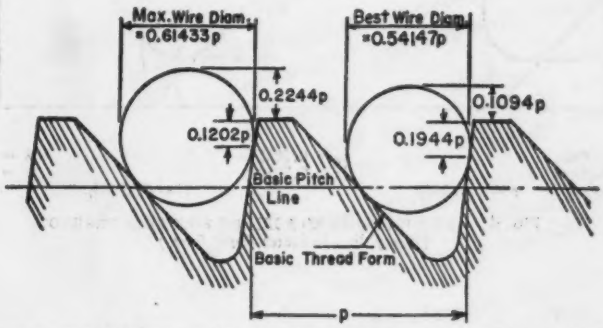

FIG. 3. DIAMETERS OF "BEST" AND "MAXIMUM" THREAD WIRES FOR BUTTRESS SCREW THREADS

Appendix D—Notes on Corresponding British Standard

The buttress thread covered in British Standard 1657:1950 Buttress Threads, published by the British Standards Institution, has a basic depth of thread of $0.4p$, instead of the $0.6p$ depth, which is the basis of this standard. However, the two standards are in agreement as to the preferred pitch series and the preferred diameter series except that this American Standard includes diameters from 1/2 to 7/8 inch not included in the British Standard. Both standards use the same formulas for the pitch diameter tolerances and allowances for the three classes common to both standards. In the British Standard, the tolerance on major and minor diameters is the same as the pitch diameter tolerance (for the same class), but provision is made for smaller tolerances where the crest surfaces of screw or nut are used as datum surfaces, or where the resulting reduction in depth of engagement has to be limited to meet the conditions imposed by specific applications.

* Continued from MACHINERY's Data Sheet for March, 1955
† See MACHINERY's Data Sheet for March, 1955

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AMERICAN STANDARD BUTTRESS SCREW THREADS—9

Appendix D—Notes on Corresponding British Standard*

The American Committee does not consider it advisable to encourage for regular use certain combinations of the larger diameters with fine pitches covered in the British Standard. However, pitch diameter tolerances for such combinations, when required, can be determined by use of the diameter and pitch increments given in Table 3.† With these exceptions, the tables for pitch diameter tolerances and allowances for sizes over 1 inch are in agreement with Tables 2, 3, and 4† in this Standard. The form of thread recommended in the British Standard is shown in Fig. 4 and the numerical data for the British form thread are given in Table 6.

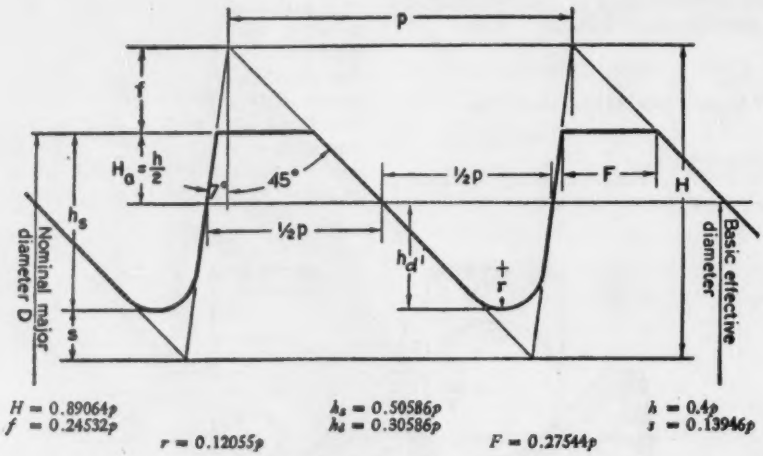

FIG. 4. BRITISH STANDARD FORM OF BUTTRESS THREAD
(Heavy line indicates basic form.)

Table 6. Numerical Data for British Standard Form Buttress Screw Threads
(Basic depth of thread = 0.4 the pitch. See Fig. 4)

Threads per Inch	Pitch, p	h	H	f	h_s	$2h_d$	s	r	F
20	0.0500	0.0200	0.0445	0.0123	0.0253	0.0306	0.0070	0.0060	0.0138
16	0.0625	0.0250	0.0557	0.0153	0.0316	0.0382	0.0087	0.0075	0.0172
12	0.0833	0.0333	0.0742	0.0204	0.0421	0.0510	0.0116	0.0100	0.0230
10	0.1000	0.0400	0.0891	0.0245	0.0506	0.0612	0.0140	0.0121	0.0275
8	0.1250	0.0500	0.1113	0.0307	0.0632	0.0765	0.0174	0.0151	0.0344
6	0.1667	0.0667	0.1484	0.0409	0.0843	0.1020	0.0233	0.0201	0.0459
5	0.2000	0.0800	0.1781	0.0491	0.1012	0.1223	0.0279	0.0241	0.0551
4	0.2500	0.1000	0.2227	0.0613	0.1265	0.1529	0.0349	0.0301	0.0689
3	0.3333	0.1333	0.2969	0.0818	0.1686	0.2039	0.0465	0.0402	0.0918
2 ½	0.4000	0.1600	0.3563	0.0981	0.2023	0.2447	0.0558	0.0482	0.1102
2	0.5000	0.2000	0.4453	0.1227	0.2529	0.3059	0.0697	0.0603	0.1377
1 ½	0.6667	0.2667	0.5938	0.1635	0.3372	0.4078	0.0930	0.0804	0.1836
1 ¼	0.8000	0.3200	0.7125	0.1963	0.4047	0.4894	0.1116	0.0964	0.2204
1	1.0000	0.4000	0.8906	0.2453	0.5059	0.6117	0.1395	0.1206	0.2754

All dimensions are given in inches.

* Continued from preceding page
† See MACHINERY's Data Sheet for February, 1955

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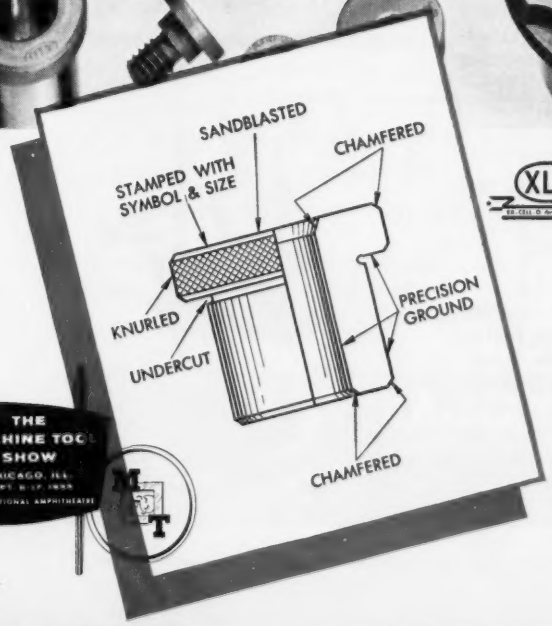
- **PREFERRED**—largest bushing users in the country are Ex-Cell-O customers.



THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 9-17, 1938
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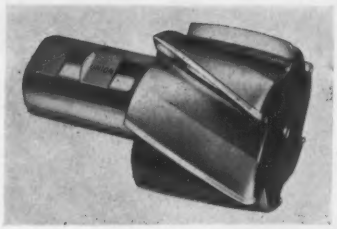


Carbide-Tipped Helical Milling Cutters

A new line of carbide-tipped helical milling cutters which combine all the advantages of preformed true helical carbide tips and true helical seat pockets has been announced by the Union Twist Drill Co., Athol, Mass. The large carbide inserts extend the entire length of the flutes and maintain a constant shearing action for the full depth of the cut. This feature is said to insure fine finishes with low power consumption and long tool life. Available in a wide variety of helical-milling, shell-end-milling, slab-milling, side-milling and end-milling cutters adapted for cutting of non-ferrous materials.

Circle Item 138 on postcard, page 257

Tapmatic Tapping Attachment

Tapmatic Corporation, of Costa Mesa, Calif., has announced its No. "300" tapping attachment. The machine operator does not need to apply spindle pressure during the tapping operation. The axial floating action of the attachment assures consistently uniform tapped holes. Tap breakage and work spoilage are reduced by means of a positive torque control provided by a spring-loaded ball clutch. The functioning of this clutch is unaffected by oil, heat or variation in spindle speed. Instantaneous reversal of the tap at any time is a feature. A Jacobs "Rubber-Flex" chuck holds the tap. The attachment is 1 3/4 inches in diameter and 3 3/4 inches long.

Circle Item 139 on postcard, page 257

High-Capacity Packaged Filtration Unit

Packaged filtration unit capable of handling up to 9000 gallons of water per hour, allowing deductions of 50 per cent for friction losses, brought out by Ruthman Machinery Co., Cincinnati, Ohio. This unit consists of a Rumaco Model 2-C all-bronze pump, with a Model 3-AX-3 Cuno filter manufactured by the Cuno Engineering Co. The driving motor of 1 1/2 H.P. operates at a speed of 3450 R.P.M. and is available for any electrical current characteristics.

Circle Item 140 on postcard, page 257

Wesson Multicut Tool-Holder

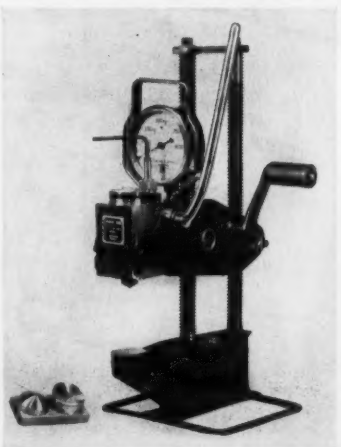
Multicut tool-holder for medium-duty machining operations, featuring "throw-away" carbide inserts that eliminate grinding, is announced by Wesson Co., Detroit, Mich. Positive chip control is provided by an adjustable carbide-tipped chip breaker-clamp serrated in steps of 0.040 inch, starting 0.050 to 0.060 inch back from the cutting edge. Adjustments range from 1/8 inch on the smaller inserts up to 5/32 and 3/16 inch on the larger sizes. Rapid one-adjustment insert indexing or changing is possible from either top or bottom of the Multicut holder since the locking screw has hexagonal sockets on both ends.

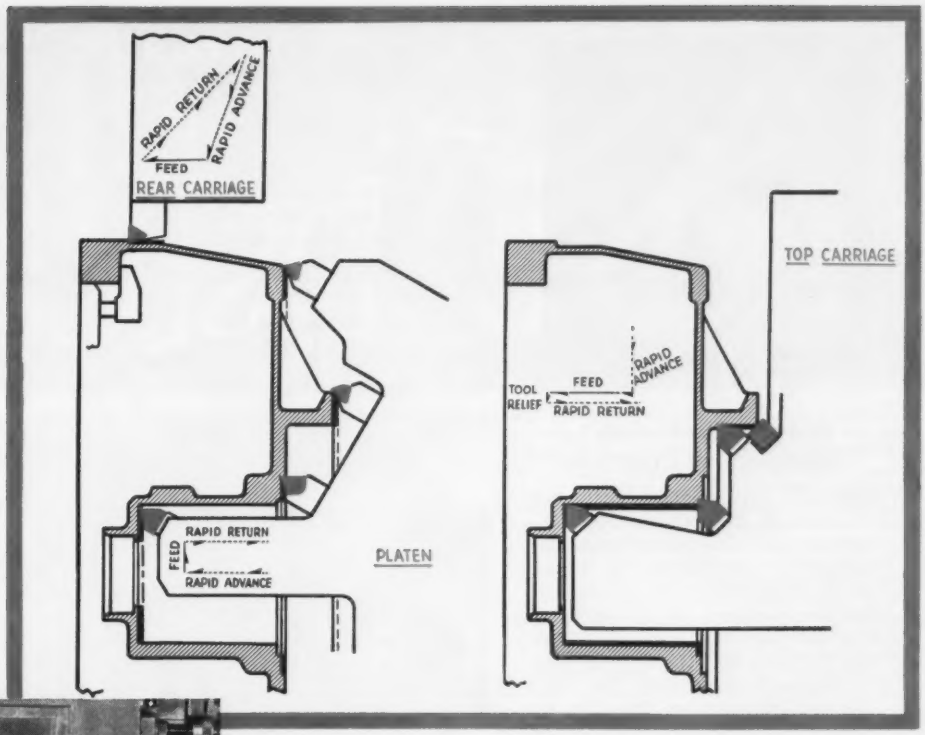
Circle Item 141 on postcard, page 257

Portable Brinell Tester for Non-Ferrous Alloy Materials

Portable, lightweight, hardness tester designed to make accurate Brinell tests on non-ferrous alloys of all kinds, recently developed by Andrew King, Ardmore, Pa. The removable head makes it possible to test parts of any size or shape, and the precision instrument can be used in any position, even upside down, with or without the base. The tester can be set to release at 62 1/2, 125, 250, 500, 750, and 1000 kilograms. Where a small impression is desirable, a 5-millimeter ball is used with a 750-kilogram load. This combination of ball and load will cover the same hardness range as a 10-millimeter ball and a load of 3000 kilograms. The tester has a throat depth of 4 inches, a gap height of 10 inches, and uses 10- and 5-millimeter balls.

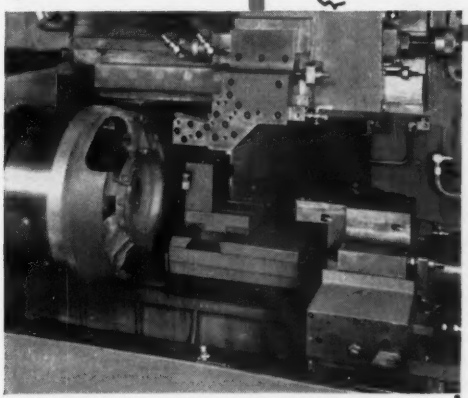
Circle Item 142 on postcard, page 257





Tooling layout for machining magnesium alloy housing. A chamfer tool is added in top carriage for finishing operations.

Tools on top and rear carriage plus platen leave front clear for easy loading. Special finger chuck prevents distortion or interference with tools.



JET ENGINE HOUSINGS ROUGHED AND FINISHED *on* SINGLE HYDRA-FEED

Just one Model HD-24 Hydra-Feed automatic lathe roughs and finishes cast magnesium alloy jet engine housings for a major aircraft engine builder. Maximum utilization of multiple carbide tooling on top and rear carriages plus a platen leaves the front of the machine open for easy loading and unloading, permitting this high production rate.

Push-button actuation is required only for clamp, feed start and unclamp—all cutting operations are automatic. A two-speed 1800/3600 rpm motor is shifted automatically as required by the machine cycle.

During a single setup, the top carriage bores three different diameters, the rear carriage turns O.D. of the housing and the platen faces three external surfaces plus the bottom of the main bore.

Hydra-Feed lathes give you all these:

- Maximum carbide performance (cam or tracer control)
- Easy loading or automation (no front obstruction)
- Maximum rate of metal removal (short tool travel)
- Decreased maintenance (JIC throughout)
- Smoothness (downward tool pressures and massive design)

Hydra-Feed lathes are produced in four standard sizes —Models HD-8, HD-12, HD-16 and HD-24.

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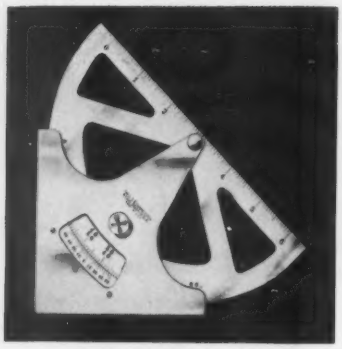
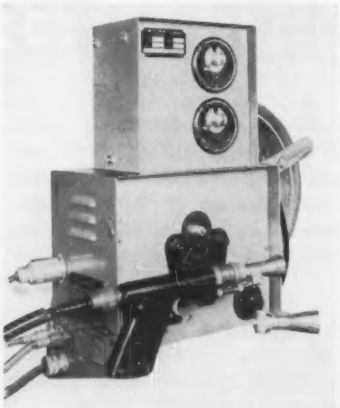


Starrett Draftsmen's Stainless-Steel Protractor

Strong, lightweight, rustproof stainless-steel protractor of convenient size with vernier scale, developed by L. S. Starrett Co., Athol, Mass. This protractor is designed for fast, positive, angular settings that are accurate within limits of five minutes or 1/12 degree. This draftsmen's protractor, No. 361, lies perfectly flat on the drawing board and can be locked at the desired setting by means of a single knurled binding nut which also serves as a knob for picking up the instrument. A 6-inch scale on the straight edge of the protractor is graduated in sixteenths of an inch.

Circle Item 143 on postcard, page 257



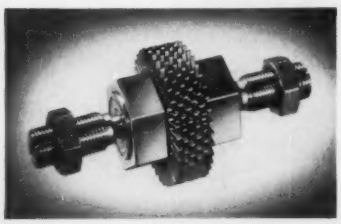
Sigma Spot-Welding Control

Sigma spot-welding equipment provided with automatic spot- and tack-welding control, recently announced by the Glenn Co., Oakland, Calif. The Glenn control can easily be attached to any Linde SWM-2 Sigma units to provide an automatically timed cycle for spot- or tack-welding. When using this control, the operator merely places the welding gun against the workpiece and pulls the trigger. The control automatically turns on the power, rod-feed, and gas and water for an adjustable pre-set welding interval. The rod-feed is shut off at an adjustable period in advance of the power cut-off to burn back any excess rod material.

Circle Item 144 on postcard, page 257

Dresser Cutter for Sharpening Abrasive Discs

"Wise Type" dresser cutter for sharpening abrasive discs, announced by Besly-Welles Corporation, Beloit, Wis., has design

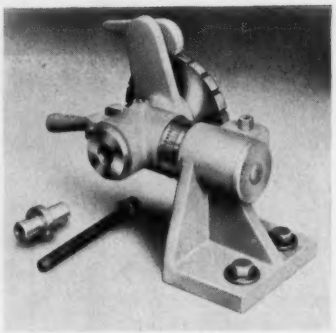


features which are said to improve the sharpening action and increase the life of the tool. The dresser has slim fingers designed to pick abrasive grain from the surface of the grinding disc instead of crushing the grain and rolling it off the disc; thus, the cutting action tends to sharpen the disc without changing its grinding characteristics. Only a comparatively light pressure of the dresser "pick-up" teeth against the disc is required for efficient sharpening. A square arbor for the cutter assembly holds the cutter firmly in place with the teeth in proper staggered position.

Circle Item 145 on postcard, page 257

Universal Indexing Work-Holder

Indexing work-holder for milling machines and pantographs, brought out by the Production Tool Division of Johnson & Bassett, Inc., Worcester, Mass. This small, lightweight holder will handle work of any face width and up to 6 inches in diameter. The work is mounted on a simple fixture, and held by a draw-bar through the hollow spindle which can be locked in any position. A graduated swivel-joint allows the work to be pivoted and clamped in any position ranging from horizontal to vertical. Index plates can easily



be changed by removing a single nut, and are available with any number of notches up to 60.

Circle Item 146 on postcard, page 257

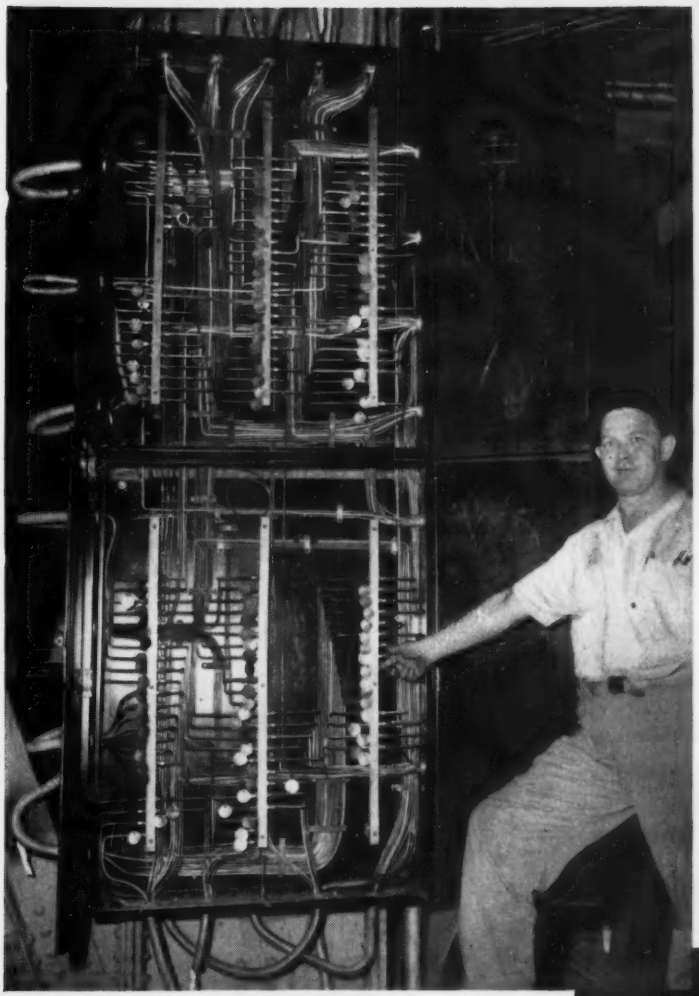
Hallowell Steel Shelving

Shelving has been developed by the Standard Pressed Steel Co., Jenkintown, Pa., to meet a wide range of storage needs. This shelving can be furnished either with or without sides and back. It can be arranged for use along production lines in machine shops, or offices. Exceptional accuracy in the location of assembly holes assures easy installation of the shelving in any combination desired. The shelves come in thirty-five different sizes, from 24 by 9 inches up to 48 by 36 inches. Posts available in 11- and 13-gage material can be furnished in heights of from 3 feet 3 inches up to 10 feet 3 inches.

Circle Item 147 on postcard, page 257

FOR INSTRUMENTATION AND CONTROL

Cabled Tube



Some time ago Revere ran an advertisement featuring Crescent Armored Multitube for use in pneumatic and hydraulic instrumentation and control systems. The advertisement created so much interest that we thought you might like to see a photograph of an actual installation. The Control Board Junction Box shown here has 22 runs of Multitube coming into this box comprising 224 Revere Copper Tubes of 1/4" O.D. The picture was taken in the Glenwood Landing, N.Y. Power Station of the Long Island Lighting Company. The tubes go to instruments that report information on temperature, main and reheat steam pressure, boiler feed and condensate pump pressure, fuel oil and gas pressure, liquid levels, tide level and for the control of fuel feed, draft dampers, boiler drum water level and various control valves.

This is a relatively new use for Revere Copper Tube, but it is an important one in these days when new ways are being found to obtain process information more quickly and accurately, or to achieve automatic control. Crescent Armored Multitube is made by Crescent Insulated Wire & Cable Co., Inc., Trenton 5, N.J., in lengths up to 1,000 feet. It consists of a group of long tubes twisted together in cable form, protected by a flexible interlocked galvanized steel armor, or by plastic, or both. As many as 19 tubes, 1/4" O.D., can be cabled, with one tube in each layer color-coded. Larger tubes can also be cabled, including 5/16", 3/8" and 1/2". This construction affords protection during shipment, installation and use, and speeds up installation greatly. For further information, write Crescent, and for tube in copper and aluminum, see the nearest Revere Sales Office.

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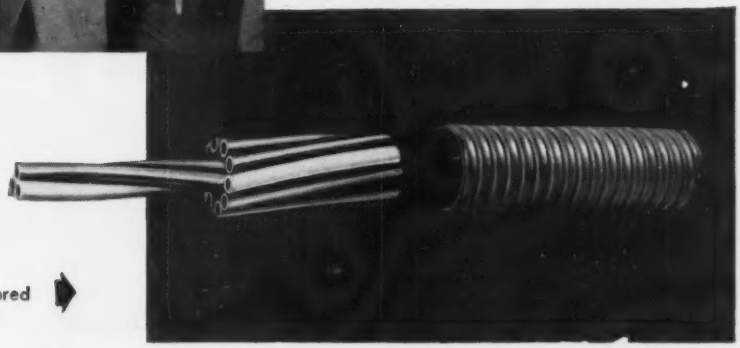
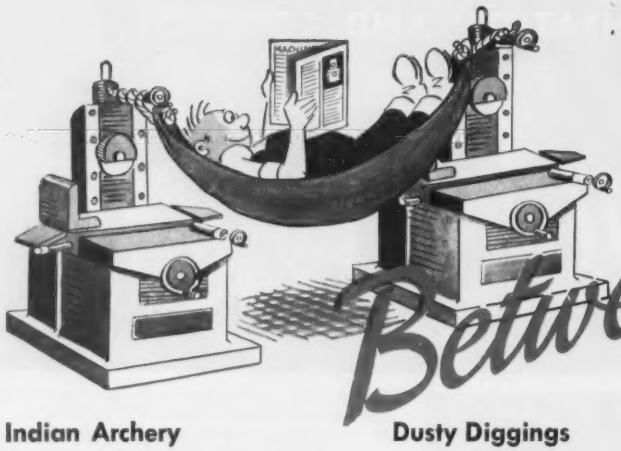
Control Junction Box at Power Station of Long Island Lighting Company, showing use of Crescent Armored Multitube. Note that relatively sharp bends can be made without damage to the cabled copper tube.



Construction of Crescent Armored Multitube.



Between Grinds

By E. S. Salichs

Indian Archery

On the Rio de Oro in South America, launches and tugs moving oil-field equipment are targets of arrows shot through the air by belligerent Motilon Indians. In *Production Road* (house organ of the Twin Disc Clutch Co.), there is a story of how Captain Gonzales agilely dodges behind a heavy wire-mesh covering built over part of the deck of the *Bolivar*, his 45-foot launch equipped with Twin Disc marine gears. By the latest count, 150 arrows have hit human targets since 1936.

For Budding Batters

Batting practice cages that have mushroomed around the country have a problem. About 300 bats a year per cage are broken by prospective Willie Mayses. Now, according to *Gould Battery News*, there is a firm in Massachusetts making bats out of magnesium. They don't break.

Dusty Diggings

One feature of a new caterpillar shovel emphasized in a recent publicity release was the roomy interior of the cab.

Or M. M.

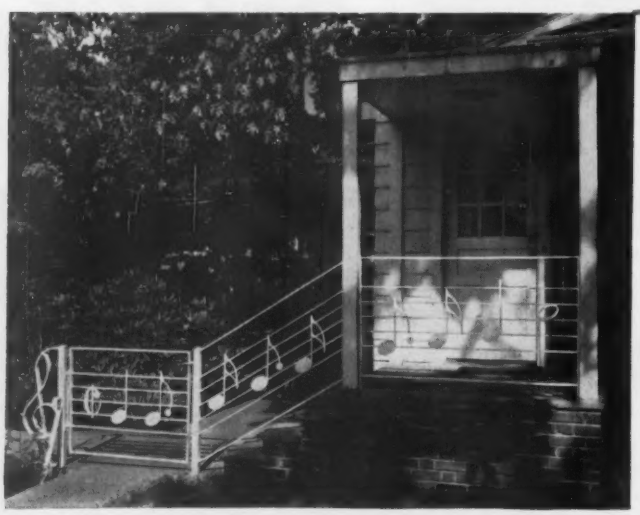
In the mail, a photoengraver solicited our magazine for business. And they were frank: "We give you a true reproduction of the copy you submit to us, but we can't make Whistler's Mother look like Marilyn Monroe." Incidentally, about 200 illustrations appear in MACHINERY every month. None of them Whistler's Mother.

Nuclear Note

In the spirit of fun, sometime back we tossed out information on a Geiger counter for locating uranium, suggesting that it could be taken to pay hotel bills while prospecting on vacation. We were surprised, however, at the requests received for information on where to obtain the instrument. In view of this, we are passing on another tip—there are improved tools for uranium prospectors. One is a much lighter Geiger counter, and the other a tester, or spectrum isolation chamber, both designed by the Menlo Research Laboratory, Menlo Park, Calif., according to the Armour Research Foundation of Illinois Institute of Technology.

Hawaiian Can-Can

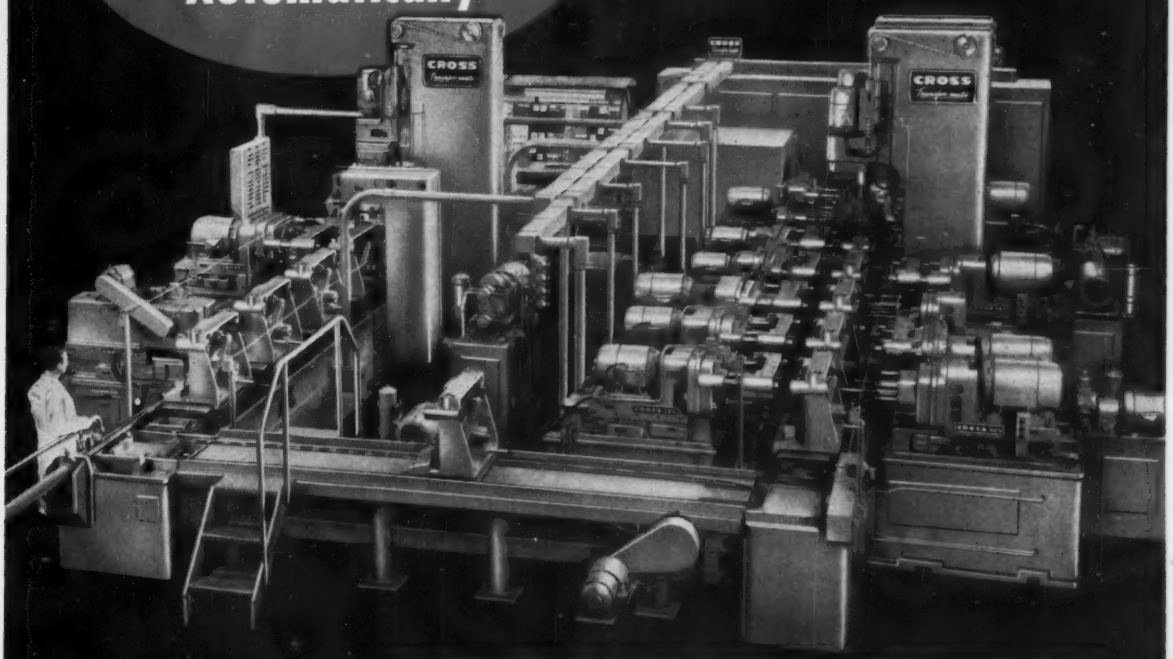
A Hawaiian pineapple company has placed a large order with the E. W. Bliss Co. for high-speed automatic machinery to be used in manufacturing can ends—scroll shears, automatic curlers, strip feed presses, and sheet feeders. Bliss will build the machinery at its new Hastings, Mich., plant. Somehow it is difficult to visualize Polynesians tending machines when publicity always has them riding the waves.



RAILLERY IN THE RAILING — This wrought-iron railing leading to the kitchen door musically reads "Let's Have Another Cup of Coffee." It was composed with Airco cutting and welding equipment in the shop of Airco dealer Irving Mittag, Welding Supply Co., Ridgewood, N. J. Should people take this permanent invitation too seriously, our music lover will be ordering another note from Mr. Mittag, to be welded after the very first note—not!

Machines Flywheel Housings and Changes Set Up Automatically

Another Transfer-matic by Cross



- ★ Completely machines (except for grinding three faces) flywheel housings for both standard and automatic transmissions.
- ★ Flexibility for scheduling because either part may be produced as required—set up changes and proper tools are selected automatically at each station.
- ★ 170 pieces at 100% efficiency.
- ★ 49 drilling, 22 chamfering, 4 reaming, 2 counterboring, 2 boring, 30 inspecting, and 30 tapping operations.
- ★ Palletized work holding fixtures with automatic transfer from station to station.
- ★ Hydraulic power wrench for clamping parts.
- ★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; automatic lubrication.

Established 1898

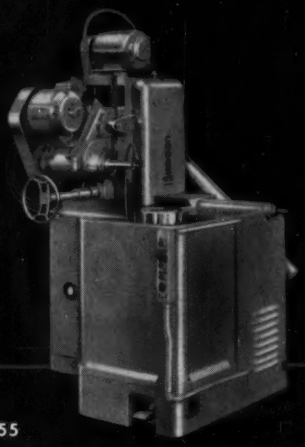
THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

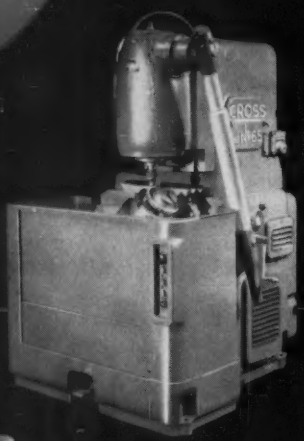
Greater Flexibility with Cross Gear Machines

for rounding • chamfering • pointing • burring



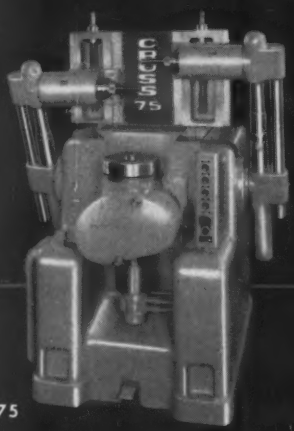
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

★ Flexibility for handling a wide variety of gears.
★ Rugged, heavy duty construction for continuous high production or job shop operation.
★ Short setup time (as little as 15 minutes) for changing from one gear to another.
★ Simple, inexpensive tooling.
★ Push button controlled automatic cycle.
★ Hydraulic power work clamping.

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 257

News OF THE INDUSTRY

Illinois

JOHN W. BODWELL has been made manager of the Work Order Division of Joseph T. Ryerson & Son, Inc., Chicago, Ill. He succeeds WILLIAM G. FINDLAY who has been given the position of assistant manager of the Ryerson plant in Detroit, Mich. HAROLD W. DAVIDSON, for the past nine years a sales representative for the Work Order Department, has been named to succeed Mr. Bodwell at the Chicago plant. CHARLES H. HALLETT has been appointed assistant manager of sales. For the past six years, Mr. Hallett has been engaged in sales work at the company's Los Angeles, Calif., plant.

R. M. HAMMES has been appointed general sales manager of the Niagara Filters Division and the Tolhurst Centrifugals Division of American Machine & Metals, Inc., East Moline, Ill. He succeeds F. C. WEICKER, who has resigned. Mr. Hammes has been with the company since 1943. He was previously assistant sales manager of the Niagara & Tolhurst Divisions for American Machine & Metals, Inc.

T. V. PURVIN has been appointed general manager of Amgears, Inc., Chicago, Ill. Mr. Purvin, who was formerly general sales manager of the company, will now have the responsibility for manufacturing, engineering, and sales.

T. V. Purvin—general manager of Amgears, Inc.

ROLL BOND PLANT, East Alton, Ill., the new factory of the Olin Mathieson Chemical Corporation, New York City, will be completed this spring. The following appointments have been made in the Metals Division: E. N. ROUSSEAU, general manager, and E. W. SHERMAN, sales manager.

HOWARD A. NELSON has been appointed sales manager of the Small Tool Division of Barber-Colman Co., Rockford, Ill. He was formerly assistant sales manager. CHARLES A. TORSON has been made sales manager of the new Hendey Machine Division, Torrington, Conn.

DENISON ENGINEERING CO., Columbus, Ohio, has opened a midwest regional branch at 7000 W. 63rd St., Chicago, Ill., to provide better service in that area. The company is introducing over-the-counter sales of hydraulic presses and controls.

LOUIS D. PARENT, JR., has been appointed special district sales engineer for the Shafer Bearing Division of the Chain Belt Co., Milwaukee, Wis. The Shafer Bearing Division is located in Downers Grove, Ill.

ARTHUR T. DALTON has been elected vice-president in charge of sales of Chicago Wheel & Mfg. Co., Chicago, Ill. Associated with the firm for thirty years, he was formerly secretary and sales manager.

NELSON M. MCGUIRE has been appointed assistant to the vice-president of sales for the American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill.

CHARLES EDWARD COONEY, JR. has been appointed chief engineer of the Mechanics Universal Joint Division of the Borg-Warner Corporation, Chicago, Ill.

WILTON TOOL MFG. CO., INC., Chicago, Ill., has purchased the assets of Rapid Titan Mfg. Co., Pentwater, Mich., manufacturer of C-clamps.

Iowa, Indiana, and Missouri

C. M. BASILE has been named vice-president of manufacturing and sales of the Cedar Rapids, Iowa, plant of the Link-Belt Corporation, Chicago, Ill. Mr. Basile joined the company in 1928 and was transferred to the Link-Belt Speeder Corporation in Cedar Rapids in 1950, where he has been vice-president in charge of operations. GORDON W. ROWAND has been promoted to sales manager and will also make his headquarters at Cedar Rapids where the company manufactures its complete line of crawler and rubber-tired shovel-cranes.

C. M. Basile, vice-president—manufacturing and sales of Cedar Rapids plant of Link-Belt Corporation

ANSEL H. GRAHAM has been named manager of engineering for the Small Integral Motor Department of the General Electric Co., Fort Wayne, Ind. He joined the company in 1939. Before his present appointment, Mr. Graham was manager of advance and development engineering in the Medium Induction Motor Department, Schenectady, N. Y.

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, has negotiated for the acquisition of the Reeves Pulley Co. of Columbus, Ind. The management at Reeves will remain intact and it will continue as a separate division.

JOHN ABELT has been appointed Kansas City, Mo., district sales manager for the Chain Belt Co., Milwaukee, Wis. He has been a district sales engineer in the Los Angeles district sales office since 1953. Mr. Abelt succeeds R. H. LONGWELL, who is now in the company's Seattle, Wash., district office.

(Left) A. J. McLaren, vice-president in charge of sales of The Cross Company; (right) Kurt O. Tech, vice-president in charge of engineering

Michigan

A. J. McLAREN has been named vice-president in charge of sales for The Cross Company, Detroit, Mich. Mr. McLaren, who has served as sales manager since 1953, has been with the company for eight years. KURT O. TECH has been appointed vice-president in charge of engineering. He has been with the company for nine years.

PRESS AUTOMATION SYSTEMS, INC., Detroit, Mich., will specialize in the engineering of special automation equipment and serve as national sales agent for the HAMILTON AUTOMATION CO., Hamilton, Ohio, manufacturers of shuttle type feeders, unloaders, and special machinery. MAURICE M. CLEMONS is president and JACK YOUNG, vice-president of the company. The firm's general offices are located at 18212 James Couzens Highway, Detroit, Mich.

MICHIGAN BROACH CORPORATION, Detroit, Mich., announces the appointment of the following sales representatives: FRANK BURGAN, Fort Wayne, Ind., covering territory in Indiana; TOOL SPECIALISTS, INC., Westbury, N. Y., who will service accounts in lower New York and northern New Jersey; A. W. SPENCER & ASSOCIATES, Buffalo, N. Y., covering the territory of western and central New York.

HENRY & WRIGHT, Division Emhart Mfg. Co., Hartford, Conn., has appointed the Motch & Merryweather Machinery Co. as sales representative for Ohio, Michigan, and western Pennsylvania. FREDERICK R. SEGHERS will continue as sales engineer for Henry & Wright in the Michigan territory, working with Motch & Merryweather Machinery Co. from their Detroit office.

CARBOLOY DEPARTMENT of General Electric Co., Detroit, Mich., announces the appointment of the B-H TOOL & SUPPLY CO., Detroit, as its distributor. The organization will carry the Carboloy Department's line of standard and special carbide metal cutting tools, as well as its diamond grinding wheel dressers.

ARTHUR F. WHITE has been appointed district manager in Detroit, Mich., for the Axelson Lathe & Milling Machine Divisions of the Axelson Mfg. Co., Los Angeles, Calif. Mr. White joined the Axelson Lathe Division in 1939 and has served the company continuously in a series of positions.

HAROLD ASHTON has been appointed manager of sales and service for the National Broach & Machine Co., Detroit, Mich. Prior to accepting this new assignment, he was chief service engineer for the company.

Harold Ashton, newly appointed manager of sales and service for the National Broach & Machine Co.

JOHN S. ROLLER has been made district sales manager in Detroit, Mich., for Firth Sterling, Inc., Pittsburgh, Pa. Mr. Roller was formerly located in Pittsburgh where he was assistant to the vice-president in charge of sales.

ALFRED L. GOSTOW has been promoted to the position of manager of methods of the Dodge forge plant of the Chrysler Corporation, Detroit, Mich.

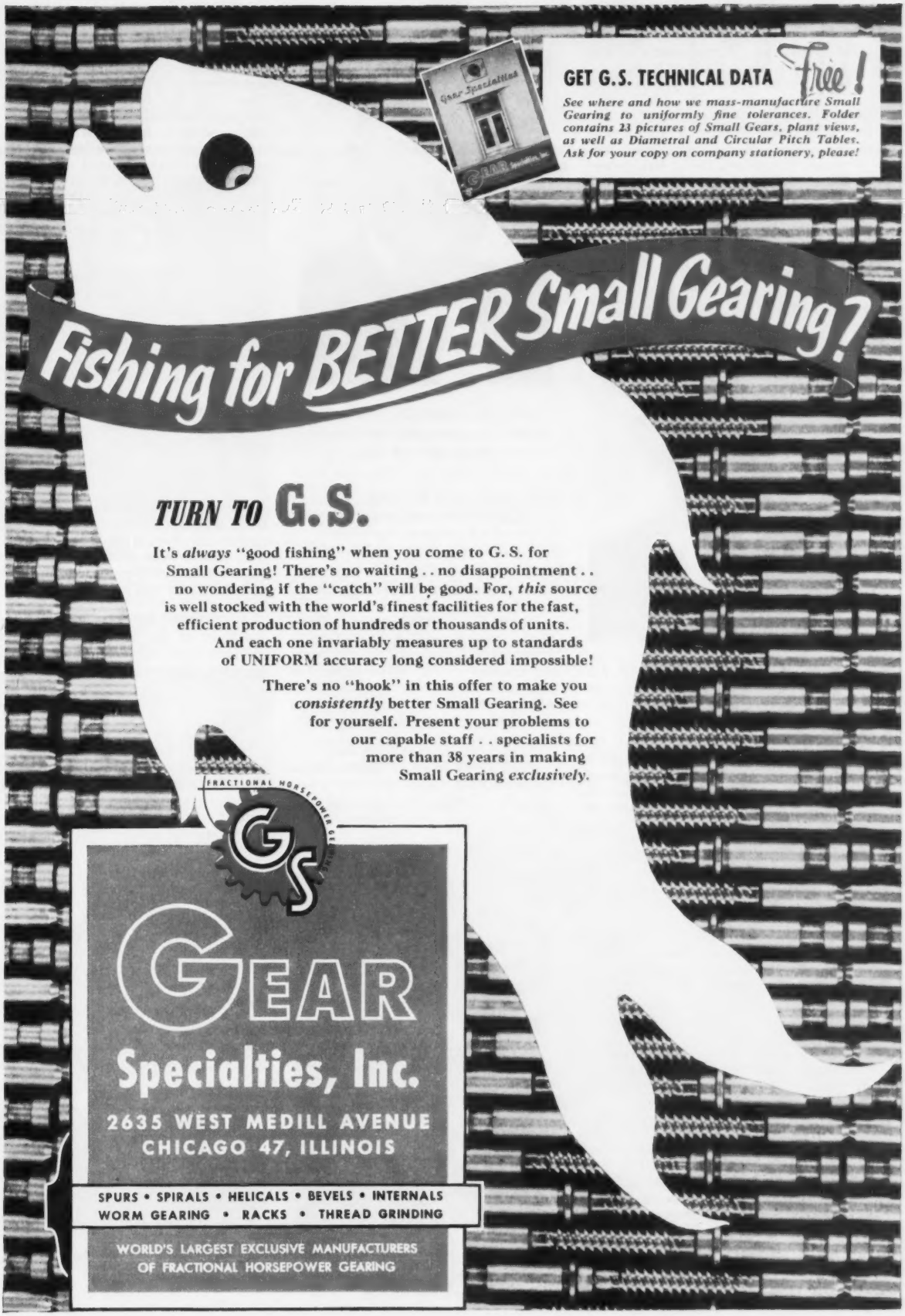
New England

NORTON CO., Worcester, Mass., announces the appointment of the following sales engineers: LAURENCE G. HOLFELDER has been assigned to the central Indiana territory; JAMES A. COLEMAN will cover the area of Kansas City, Mo.; RAYMOND B. GOODALE has been appointed field engineer at the Chicago district office; WILLIAM A. SIMONDS will cover northern Texas; and PAUL B. FOXWELL will cover southern Texas.

EDWIN E. PARKER has been appointed general manager of the Instrument Department of the General Electric Co., Lynn, Mass. Mr. Parker succeeds C. HOWARD BLACK, who has been named general manager of the company's Construction Materials Division at Bridgeport, Conn.

J. JOSEPH KELLY has been appointed sales manager of the Reed-Prentice Corporation, Worcester, Mass., an affiliate of Package Machinery Co. Mr. Kelly was formerly field sales manager of the parent company.

J. Joseph Kelly, newly appointed sales manager of Reed-Prentice Corporation


GET G.S. TECHNICAL DATA
Free!
See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!
Fishing for BETTER Small Gearing?
TURN TO G.S.
It's always "good fishing" when you come to G. S. for Small Gearing! There's no waiting . . no disappointment . . no wondering if the "catch" will be good. For, this source is well stocked with the world's finest facilities for the fast, efficient production of hundreds or thousands of units. And each one invariably measures up to standards of UNIFORM accuracy long considered impossible!
There's no "hook" in this offer to make you consistently better Small Gearing. See for yourself. Present your problems to our capable staff . . specialists for more than 38 years in making Small Gearing exclusively.
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2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS
SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

ROBERT W. STODDARD was made president of Wyman-Gordon Co., Worcester, Mass. SACKET R. DURYEE, treasurer of the company, was named vice-president as well.

AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn., has purchased the Allison Co. of Bridgeport, Conn., manufacturer of abrasive cutting wheels for thirty-five years. The Allison Co., which has worked closely with the Campbell Machine Division of the American Chain & Cable Co.,

Hugh V. Allison, president of the Allison Co., newly acquired concern of American Chain & Cable Co., Inc.

Inc., for many years, will continue to operate at its plant in Bridgeport. HUGH V. ALLISON will continue in his present capacity as its president.

FOLKE GUSTAFSON and ROBERT W. GRADY have been appointed to the sales staff of the Small Tools and Gage Division of the Hanson-Whitney Co. Division of Whitney Chain Co., Hartford, Conn.

THE YODER CO., Cleveland, Ohio, has moved its eastern district office from 11 W. 42nd St., New York City, to the Ridgeway Professional Building, Stamford, Conn.

F. J. GAFFNEY has been appointed vice-president of engineering by the Marion Electrical Instrument Co., Manchester, N. H.

N. DOUGLAS MACLEOD, JR. has been named executive vice-president of Abrasive Machine Tool Co., East Providence, R. I. Mr. MacLeod joined the company in 1946 as an apprentice machinist. He then worked in inspection, and was later named personnel manager. In 1941 he was promoted to production manager and served in that capacity until 1954 when he was appointed as assistant

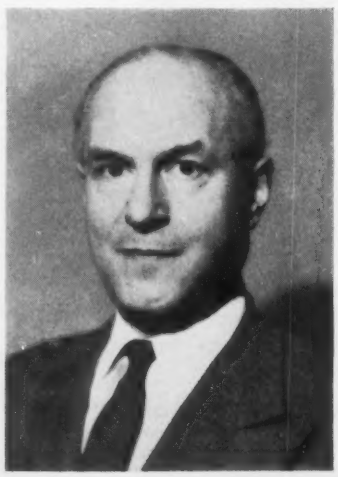
N. Douglas MacLeod, Jr., who was made vice-president of Abrasive Machine Tool Co.

general manager. In his new position his duties will encompass the supervision of all company operations.

New York and New Jersey

OMER E. ROBBINS Co., Detroit, Mich., has appointed MACHINISTS' TOOLS, INC., Buffalo, N. Y., sales representative for its Magna-Sine magnetic sine tables and non-magnetic sine plates in the western New York territory.

ARNOLD S. ROSTAN has been appointed as director of international operations for Morey Machinery Co., Inc., New York City. His headquarters will be in the company's New York office.



Arnold S. Rostan, director of international operations of Morey Machinery Co., Inc.

ALBERT P. GAGNEBIN has been appointed assistant manager of the nickel sales department by the International Nickel Co., Inc., New York City. Mr. Gagnebin joined the company in 1932. EDWARD B. BITZER has been appointed assistant manager of the nickel alloys department. Mr. Bitzer joined the company in 1931. KEITH D. MILLIS has been placed in charge of the Ductile Iron section of the development and research division, succeeding Mr. Gagnebin.

THE CARBORUNDUM COMPANY, Niagara Falls, N. Y. has acquired the CURTIS MACHINE CORPORATION, Jamestown, N. Y. WILLIAM H. WENDEL, vice-president in charge of Carborundum's Coated Abrasives Division in Wheatfield, N. Y., will coordinate the activities of Curtis Machine Corporation in The Carborundum Company. GENE DEMAMBRO, president and general manager of Curtis Machine Corporation, will continue in that capacity.

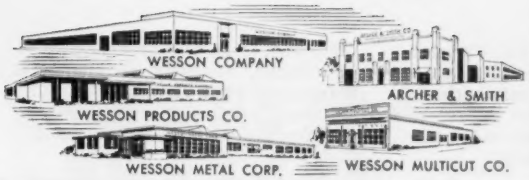
FRED L. AMTER has been appointed sales manager of Federal Carbide & Cutter Co., Inc., Rochelle Park, N. J. Mr. Amter was formerly with the Eastern Cutter Corporation of Newark, N. J., as tool sales engineer.

D. T. BIXBY has been named sales manager of the Standard Products Division of the De Laval Steam Turbine Co., Trenton, N. J.

Ohio

E. V. DOWDEN has been named a vice-president of the Osborn Mfg. Co., Cleveland, Ohio. He joined the company in 1941 as an industrial engineer in the company's machine division. He then became manufacturing

E. V. Dowden, who has been named vice-president of the Osborn Mfg. Co.



carbide NEWS

Special Wesson Multicut holder for diamond-shaped 55° throwaway inserts. The top of the locator and back-up plate can be seen below the end cutting edge. Chip breaker-clamp on top of the tip is adjustable. The holder and diamond-shaped inserts are specials. They broaden the standard "no grind" line of Multicuts, tips for which are shown below.

First Holder For 55° Throwaways Announced

Permits undercutting, contouring, turning, etc. in confined places

Wesson engineers have developed the first successful throwaway insert holder for use of 55° diamond-shaped inserts. The announcement was made following successful completion of tests.

The major problem preventing development of such a holder in the past has been the difficulty of locating and holding the thin insert securely while cutting. This has been overcome in the special Wesson holder by use of anvil-locator plates to both support and back up the tip.

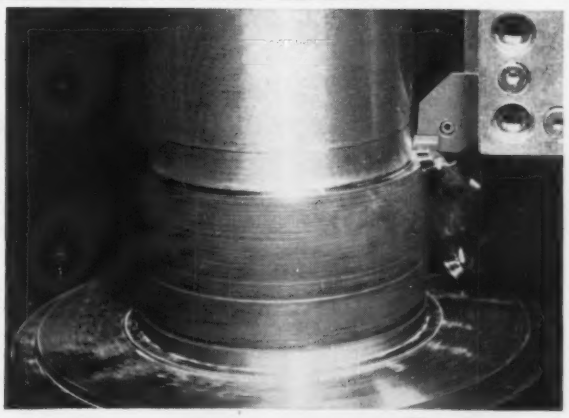
Big advantage of this new holder development is the ability of the holder to perform undercutting, contouring, turning and facing operations in confined places—thus extending the economies of "no grind" inserts to these tracer-lathe operations.

The holders and inserts are listed as specials and are in addition to the line of standard holders for round, triangular, and square inserts announced by Wesson last month.

Field tests on the new holder, listed as model MX-26-T6, include machining of the thread diameter on an SAE 8620 automotive stem pinion. Feed was .012-.014 in.; depth of cut 3/16 in. Average production per cutting edge was 623 pieces, or a total of approximately 2500 pieces per throw-away insert. Wessonmetal Grade WM was used for the insert.

Offset Multicut Holder Added to Standard Line

Particularly useful for combined turning and facing, Wesson Multicut band-type holders are now available in right and left hand offset styles (Models GAR and GAL). By angling the holder in the tool block 5°, the tool can be used for square shoulder turning and facing without resetting. It uses the standard Wessonmetal style D-80 solid diamond-shaped insert with 80° included angle. Ask for Bulletin GAR-GAL.



Metal-removal rate was boosted 33% and tool life per grind was more than doubled in the turning of the machine tool spindles by a large Eastern machine tool builder with this new standard Wesson Multicut offset band-type holder. Machine speed was unchanged. The spindle is SAE 1045 and 200 Brinell.

tools Wesson carbide Wessonmetal

Bulletin #552-M is now available from Wesson. It gives specifications, prices, etc., of the standard Wesson Multicut holders for throwaway "no-grind" inserts. Write to:

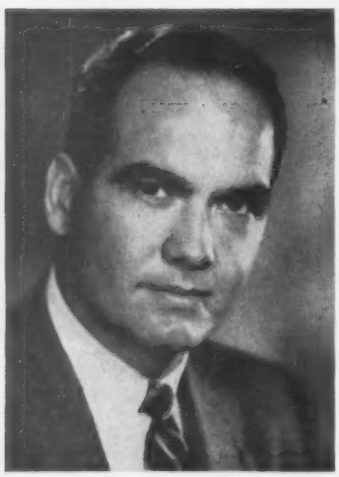
WESSON COMPANY, Dept. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

superintendent of the brush division, factory manager of the brush division, and finally, brush division manager—a position he will continue to hold in his new appointment.

Paul W. Brannon, vice-president of Cloyes Gear Works, Inc.

PAUL W. BRANNON has been appointed vice-president of Cloyes Gear Works, Inc., Cleveland, Ohio. The company is planning a major expansion of its commercial gear production, and Mr. Brannon has had many years of specialized experience in this field. His most recent position has been as vice-president and works manager of the Pesco Products Division of Borg-Warner Corporation.

C. THORPE THOMPSON was recently appointed executive vice-president and general sales manager of the Cleveland Instrument Co., Cleveland, Ohio. He will head the company's activities in the field of automatic gaging, sorting, and control devices, and will integrate their national dstribution of gaging equipment.

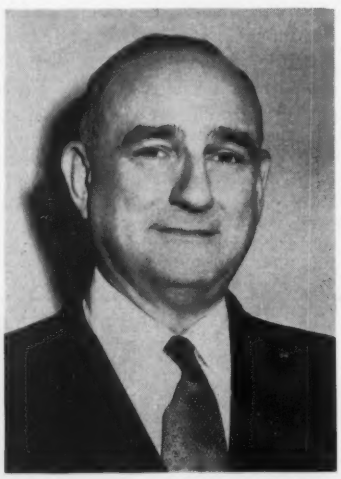


C. Thorpe Thompson, vice-president and general sales manager of the Cleveland Instrument Co.

DR. M. EUGENE MERCHANT, assistant director of research of the Cincinnati Milling Machine Co., Cincinnati, Ohio, was the recipient of the Sixth Annual Outstanding Engineer Award, presented by the Technical and Scientific Societies Council of Cincinnati at their recent Twentieth Annual Joint Meeting.

VINCENT CADA has retired after thirty-eight years of service with the Eaton Mfg. Co. of Cleveland, Ohio. He joined the company in 1917 and became purchasing agent in 1919. Mr. Cada was made manager of purchases for the entire Eaton organization in 1938, the position which he has held until retirement.

DONALD D. GULLING has been appointed equipment sales manager of the Industrial Division of Lempco Products, Inc., Bedford, Ohio. Mr. Gulling is head of the new department created by an expansion program for the manufacture and distribution of the company's industrial equipment.



Donald D. Gulling, equipment sales manager of the Industrial Division of Lempco Products, Inc.

EVERETT A. SISSON has been appointed sales manager of the brush division of the Osborn Mfg. Co., Cleveland, Ohio. He replaces GEORGE LUNDBERG, who has resigned. H. L. BURTON, JR., has been promoted to the position of assistant sales manager of the brush division.

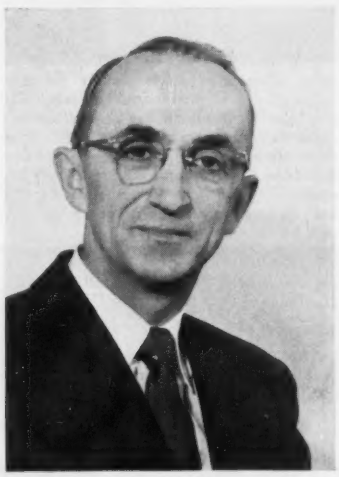
JOHN N. ROCHE has joined the staff of Motch & Merryweather Co., Cleveland, Ohio, as a press specialist. Mr. Roche, formerly of Henry & Wright, Division Emhart Mfg Co., will serve in an advisory capacity on all sales of the Henry & Wright dieing machine.

OHIO KNIFE CO., Cincinnati, Ohio, has opened a new office at 14 Penn Ave., Salem, Ohio. The Salem office is under the supervision of W. WENTZ ALSPAUGH.

K. H. HULBERT has been appointed general sales manager for the Cornwell Quality Tools Co., Magadore, Ohio.

Pennsylvania

WILLIAM H. FOSTER has been named general manager of the Pittsburgh Gear Co., Pittsburgh, Pa., a subsidiary of Brad Foote Gear Works, Inc., Chicago, Ill. Mr. Foster who has been associated with the gear industry for many years was formerly manager of the Gear Jobbing Division of W. A. Jones Foundry & Machine Co., Chicago, Ill. Prior to that, he was manager of the Gear Division of the Philadelphia Gear Works.



William H. Foster, general manager of the Pittsburgh Gear Co.

DONALD J. ZEIGLER has been appointed Pittsburgh district sales manager for the Wright Hoist Division and the Ford Chain Block Division, York, Pa., of American Chain & Cable Co., Bridgeport, Conn. He will make his headquarters at 3000 Liberty Ave., Pittsburgh, Pa. Mr. Zeigler joined the company in 1952 and served, until recently, as a sales representative for these divisions in the Southwest.

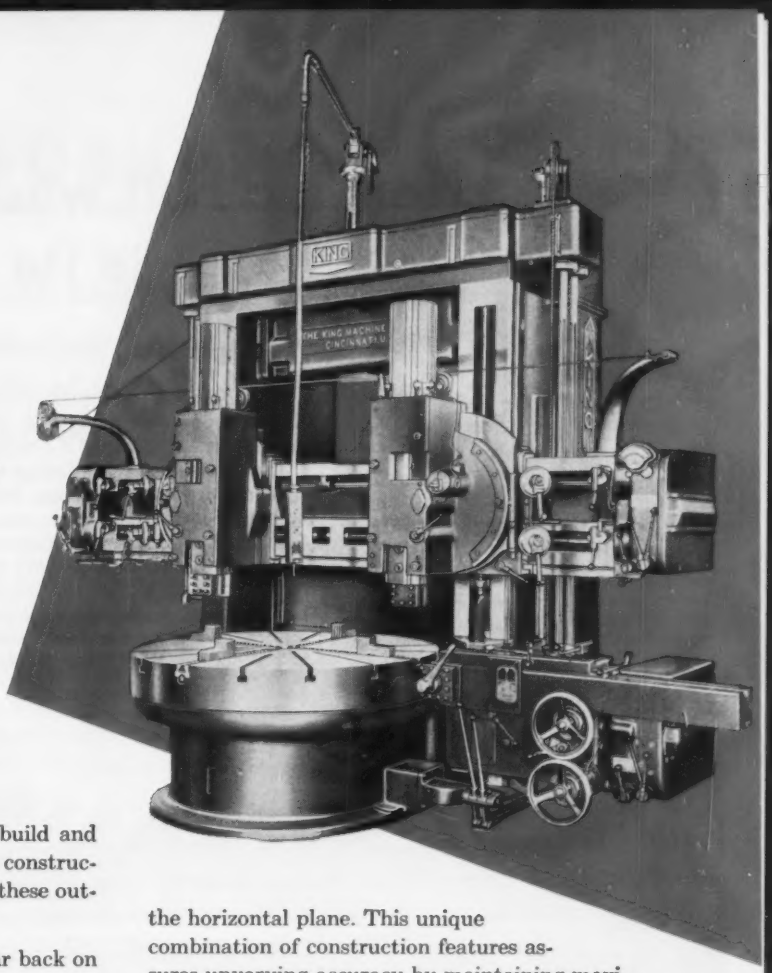
(*Continued on page* 262)

KING

VERTICAL BORING AND TURNING MACHINES

Are Built Extra-Rugged, Extra-Rigid, For

Consistently High Accuracy

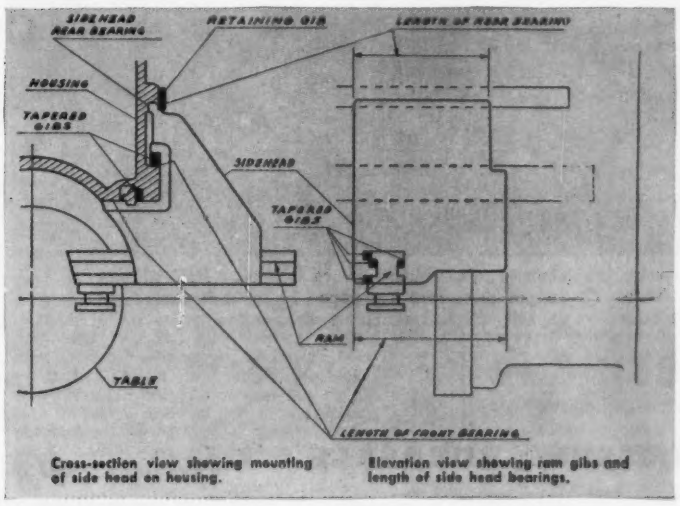


Typical of KING® superiority in rugged build and sturdily maintained rigidity is the side head construction illustrated and described here. Compare these outstanding construction details:

A full-length side head bearing is mounted far back on the side of the machine housing, extending back against the housing and held by a retaining gib. The other side head bearings are sturdily gibbed to the housing guides at all points of possible rotation, using adjustable tapered gibs. The accuracy of the ram within the side head is maintained by adjustable tapered gibs, two for adjustment in the vertical plane and two for adjustment in the horizontal plane. This unique combination of construction features assures unvarying accuracy by maintaining maximum ram and side head rigidity with resultant maximum resistance to deflection of the ram or rotation of the side head in any direction.

Extremely heavy cuts can be taken with the side head at feeds and speeds even beyond the capacity of the best modern cutting tools. Accuracy is maintained under the most severe conditions—such as work on pieces of small diameter in relation to table diameter, where the ram, extended inward, has considerable tendency to cause rotation of the side head.

This kind of *extra quality* construction *throughout* KING machines is your best guarantee of accurate, dependable performance. For full details see your King Distributor, or write us direct.



Cross-section view showing mounting of side head on housing. Elevation view showing ram gibs and length of side head bearings.

KING machines are made in ten sizes: 30", 36", 42", 52", 62", 72", 84", 100", 120", and 144"—the *widest* size range in the vertical boring and turning machine field. All size KINGS are available in a variety of head combinations, with or without side head.

KING AMERICAN STEEL FOUNDRIES • KING MACHINE TOOL DIVISION
1150 Tennessee Avenue . . . Cincinnati 29, Ohio
VERTICAL BORING & TURNING MACHINES

Here's a bolt whose weakness is its strength!

Making a bolt that fails precisely when it should requires specialized manufacturing skills.

This is the job New Holland Machine Company, farm equipment manufacturers, turned over to RB&W. The bolt is used on the flywheel of a New Holland baler. "Critical" is a weak word for its importance to the baler.

If the baler picks up a foreign object such as a rock or stone, this bolt *must* snap to prevent gear breakage. But it can't fail too soon—when the baler eats up extra-heavy windrows, for example. If it failed every time this happened, the farmer would spend all day replacing bolts — instead of making hay.

RB&W worked hand-in-glove with New Holland engineers in the tough job of heat-treating a standard machine bolt to these exacting specifications. It took a lot of ingenuity — but paid off. You can expect the same kind of service, cooperation and end product when you drop your fastener problem in our hopper. RUSSELL, BURDSALL & WARD BOLT AND NUT CO., Port Chester, N.Y.

UP TO TWELVE TONS OF HAY AN HOUR is the capacity of New Holland's Super 77 power take-off baler. With every minute vital in harvesting, farmers can't take chances on machinery failure — so New Holland built rugged parts into the Super 77, gave it extra-large capacity for fast, reliable operation.

RB&W **RUSSELL, BURDSALL & WARD**

110 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N.Y.; CORAOPOLIS, PA.; ROCK FALLS, ILL.; LOS ANGELES, CALIF. *Additional sales offices at:* ARDMORE (PHILA.), PA.; PITTSBURGH; DETROIT; CHICAGO; DALLAS; SAN FRANCISCO. *Sales agents at:* NEW ORLEANS, DENVER, SEATTLE. *Distributors from coast to coast.*

For more information on products advertised, use Inquiry Card, page 257

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

DYNA-SHIFT LATHE—Monarch Machine Tool Co., Sidney, Ohio. 25-page catalogue with illustrated text describing the company's new Series 90 Dyna-Shift lathe, and including Models 2500, 2501, and 2502. The power to break and the speed to burn any carbide tool have been built into the new heavy-duty machine. It is designed specifically to permit carbide tooling to be used to the fullest advantage on work of considerable size. Information is supplied covering the simplicity of operation made possible by the new type of headstock drive which facilitates obtaining, automatically, the right surface cutting speed for any given work diameter. This catalogue can be obtained by request on a company letterhead direct to the above concern.

SPEED REDUCERS—Horsburgh & Scott Co., Cleveland, Ohio. Catalogue 55 containing complete line of speed reducers and geared drives. Ratios and ratings for worm helical speed reducers are listed. Increased overhung load capacities are explained, and rating tables are included. New tables show detail dimensions of standard worms and gears to aid in the design of equipment with built-in speed reducers. There is also a section on engineering data. Can be obtained on company letterhead request direct to the above address.

SHAPED WIRE—Page Steel and Wire Division of American Chain and Cable Co., Monessen, Pa. Catalogue DH-1226, consisting of 16 pages of helpful information on shaped wire. Described are profiles available in cross-sectional areas up to and including 1/4 inch square, and in flats and rectangles in widths up to 3/8 inch—the ratio of width to thickness not exceeding 6 to 1. Complete figures are given for calculating areas and weights of the more common shapes. Also included are physical properties charts, millimeter and hardness conversion tables, standard wire gages, and stock lists of carbon steels and stainless steels. Common uses for shaped wire are furniture stripping, grooves for sliding doors, grooved choke wires, valve-stem keystock, oil-retaining rings, snap-rings and lock-spindles. 1

CARBIDE GRADE SELECTION—Carboloy Department of General Electric Co., Detroit, Mich. 5-page leaflet giving speed and grade suggestions for proper carbide grade selection with accompanying tables which suggest first choice carbide grades, and secondary selections for various materials machined in metal-working plants today. The tables include feeds, speeds, depths of cuts for average work on steels, cast iron, non-ferrous, non-metallic materials, in addition to work involving heat resistant alloys, and stainless steels. Safe speeds to start when cutting are also indicated. The new grades 350 and 370 have been incorporated to show where they can be used most effectively in relation to other carbides. 2

VAPOR DEGREASING—Ramco Equipment Corporation, New York City. Bulletin 953-1, describing vapor degreasing, its advantages, and the latest equipment available. Specifying when it may be used to free metal surfaces from grease, oil, resin, wax or lubricants—before electroplating, assembly, heat-treating, inspection and testing, enameling, painting, lacquering—or after stamping and drawing—or between machining operations. Cut-away illustrations show various types of equipment available and how each meets a specific cleaning problem. Information is also given on three fundamental cycles of degreasing—pure vapor, vapor-spray, and liquid-vapor. 3

EXTENSION AND THREADED SHANK DRILLS—Whitman & Barnes, Plymouth, Mich. Pamphlet covering aircraft drills and including extention drills designed for use where drilling operations on aircraft bodies cannot be reached with regular length drills. Also described are threaded shank drills. These tools are employed when ordinary drilling units cannot conveniently be used in close quarters, or at difficult angles, and it is advantageous to make use of angle-drives and flexible shaft-drives with screw adapters. Separate adapters are required for plain-threaded shank drills, but on the hexagonal type of shank, the adapter is an integral part of the drill. 4

CARBIDE HOLDERS—Wesson Co., Ferndale, Mich. Bulletin 552-M, containing information on advantages and mechanical features of the Multicut series of holders for throw-away carbide inserts. Separate tables for each holder give sizes available, shank dimensions, insert catalogue numbers, and insert dimensions. Large, illustrated composite table gives detailed data on anvil locaters, carbide-tipped and steel clamps, taper head screws, and clamp locking screws used with the various sizes and styles of the holders. Also included are sketches, photographs, and tabular information on the standard round, square and triangular throw-away inserts used. 5

STRAIGHTENING FERROUS AND NON-FERROUS PIPING AND TUBING—Mackintosh-Hemphill Co., Pittsburgh, Pa. 24-page brochure analyzing two basic straightening methods—two plane vs. rotary machines. Detailed information is given on how to adjust and operate a rotary straightener; the design and use of entry and delivery tables; flood lubrication; single and multi-speed drives vs. variable speed drives, and the design and

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performance of straightening rolls in a rotary-type machine. Also presents 11 case studies that report production performance of rotary straighteners working on a variety of pipe and tubing in both small and large metal-working plants. **6**

WELDING MACHINES—Expert Welding Machine Co., Detroit, Mich. 54-page catalogue describing a variety of welding machines, automation machines, and special machine tools. Forty-six individual types of automatic welders for submerged arc, resistance and Heliarc welding operations are described and illustrated. There is information and photographs on automatic assembly and automatic nut torquing machines. Horizontal and vertical boring machines, and drilling and tapping machines are also illustrated in a special magazine section. **7**

SEMI-AUTOMATIC MACHINES FOR SAWING, FILING, GRINDING AND POLISHING—DoAll Co., Des Plaines, Ill. 20-page catalogue describing the "Contour-Matic" machines featuring hydraulically-powered tables and controls permitting full utilization of the company's high-speed steel saw band. Various sizes and models are described. Information is also given covering accessories that extend the applicability of band-machining and high-speed band sawing machines for cutting light metals, woods, plastics and friction sawing of ferrous metals. **8**

PRECISION TOOLING—L. S. Starrett Co., Athol, Mass. 464-page catalogue published to commemorate the company's seventy-fifth anniversary. Eighty-five new tools are featured, plus other additions to the line of hand-measuring tools and precision instruments, steel tapes and rules, dial indicators and gages, hacksaws, band saws, band knives, and precision-ground die and flat stock. Instructions for using the tools and typical applications are both described and illustrated. The catalogue is sectionalized, indexed, and cross-referenced. **9**

PORTABLE MIXERS—Eastern Industries, Inc., East Norwalk, Conn. Bulletin 520-P providing product and engineering information, and diagrams as a guide in choosing the proper portable mixer and accessories for handling an extensive range of agitation jobs. Among the units described are 420, 1125 and 1725 R.P.M. mixers, variable-speed mixers, air-driven mixers, and accessories to solve special problems, such as bracket mounts, swivel clamps, quick-release couplings, and stabilizing-ring propellers. **10**

HORIZONTAL CASE MILLIVOLTMETER CONTROLLERS — Industrial Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Bulletin 1060 featuring the latest addition to the line of Brown millivoltmeters. The controller incorporates the established Brown design features, and also introduces a new three-zone control form that is adjustable from 0 to 100 per cent, or from 0 to 10 per cent of full scale, as desired. Specifications, descriptive list of control forms, and drilling dimensions are included. **11**

PARALLEL-SHAFT GEAR DRIVES—Link-Belt Co., Chicago, Ill. Catalogue 2619, containing 32 pages and listing thirty-nine standard size—single, double, and triple reduction drives, permitting a standard ratio selection from 1.2:1 to as large as 323:1, with horsepower capacities of over 2000. The booklet also contains complete engineering data, including simplified horsepower tables, dimensions, and overhung load capacities for selection from the standard line. Baseplates and built-in backstops are also covered. **12**

HARDNESS TESTER—Testing Machines Division of Gries Industries, Inc., New Rochelle, N. Y. Bulletin A-16, descriptive of the Micro-Reflex high-precision apparatus and outlining some of its applications, such as: hardness tests of hard layers below 0.004 inches in thickness; very thin metal sheets and foils; small, highly stressed parts of watches and small driving gear; layers of metal plating; small precision tools, particularly at edges; and micro-constituents of the structure of metals and alloys. **13**

SPECIAL MACHINE TOOLS—Snyder Tool & Engineering Co., Detroit 7, Mich. 12-page catalogue containing information on automation machines, special machines tools and mill-balancing machines. Describing and illustrating transfer machines, center column machines and special machines for a wide variety of metal-working operations including drilling, reaming, tapping, boring, turning, milling, and mill-balancing. Design and manufacturing facilities are also featured. **14**

PREHEATING CHART—Tempil Corporation, New York City. Chart listing recommended preheating temperatures for seventy-nine commonly used metals and alloys. Plain-carbon steels, high-tensile steels, medium-chrome moly steels and plain-chrome steels are some of the metal groups for which approximate compositions and recommended preheat temperatures are shown. Factors influencing temperatures, and the desirable effects of correct preheating on metal properties are enumerated. **15**

ALLOY STEELS—Climax Molybdenum Co., New York City. 200-page handbook entitled "Alloy Steels Pay Off," offered by the company and containing data on the advantages of fabricating with alloy steels for improved weight-to-strength ratios in such things as construction, electrical equipment, and machinery; also describing the merits of high impact strength and shop load resistance, as well as economy from improved resistance to corrosion and wear. Sixty case histories are included. **16**

ELECTRICAL OR MECHANICAL CONTROLS AND COMPONENTS—Curtis Development & Mfg. Co., Milwaukee, Wis. Bulletin DS-133, describing specialized development of electrical and mechanical controls and components, and illustrating the broad scope of development problems which have been solved by the company. Suggested aids will be of interest to the manufacturer who has a problem of electrical or mechanical controls and components that is beyond the facilities of his own organization. **17**

PRESSURE-SENSITIVE TAPES—Minnesota Mining and Manufacturing Co., St. Paul, Minn. 52-page manual showing how forty-seven of the more than 300 available tapes can be used by nearly every segment of the metal-working industry. Booklet is divided into sections covering tape uses for machining and finishing, electroplating, stamping and

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fabricating, welding, product assembly, painting, product promotion, packaging and shipping, plant maintenance, and various miscellaneous operations. 18

TITANIUM TUBING AND PIPE—Alloy Tube Division, Carpenter Steel Co., Union, N. J. Bulletin listing advantages and applications of two grades of titanium tubing and pipe. Also given are the physical properties of both grades, with data on corrosion resistance, machining characteristics, forming, welding, heat-treating, and cleaning. A selection of test pictures shows conditions that titanium can be expected to withstand in application. 19

DRILLING AND TAPPING EQUIPMENT—Michigan Drill Head Co., Detroit, Mich. 24-page catalogue describing feed units, tapping units, hydraulic drill presses, and fixed center and adjustable center drill heads. Also containing information on multiple drilling applications. Technical data is included on feeds, speeds, and horsepower required for drilling. Index-tables and separate inserts are provided for reference. 20

BRAZING ALLOY—Air Reduction Sales Co., New York City. 24-page manual explaining the application of the major brazing methods in joining metals using silver alloys and filler metals, fluxes and gas atmospheres. Over 20 tables, drawings and illustrations are included. Also discussed are silver brazing procedures, selection of brazing and filler metals, design of brazed joints, pre-braze cleaning, and assembly of brazed joints. . .21

NITRALLOY AND NITRIDING—Nitralloy Corporation, New York City. 48-page booklet containing seventeen charts and five graphs which help to define compositions, mechanical properties, and case-hardening capabilities of four principal types of the special Nitralloy steels. In addition, there are eighteen photographs and six line drawings illustrating nitriding equipment and installations, chemical reactions produced by the process, and samples of nitriding machine parts. .22

PIPE FITTINGS—H. K. Porter Co., Inc., Watson-Stillman Fittings Division, Roselle, N. J. Bulletin describing 150 pound stainless steel pipe fittings, as well as presenting dimensional specifications in sizes 1/8 inch to 2 inches in both screwend and socket-welding types. Fittings made in the line include 90 degree elbows, tees, 45 degree elbows, crosses, couplings, reducers, pipe caps, unions, plugs and bushings. 23

PRECISION PUNCHES AND PIERCING ACCESSORIES—Pivot Punch & Die Corporation, North Tonawanda, N. Y. 20-page catalogue introducing all types of standard punches now available in 1/64-inch increments in three qualities of high-speed steel. Included is information on bridge lock punches for quick replacement, punch blanks, and pilot-punches in high-speed steel, ball-seat and press-fit die buttons, and new type of offset and square retainers for high-production. 24

BEARING HANDBOOK—McGill Mfg. Co., Inc., Valparaiso, Ind. 52-page publication having sections on several series of full type roller bearings. Each section contains a cut-away photograph and a detailed line drawing of each model in each series, and includes dimensional and load capacity tables and mounting details. In addition, there are tables on bearing life factors, bearing speed factors, and interchangeability charts. . .25

PRECISION MACHINE VISE—Kearsarge Tool & Mfg. Co., Erie, Pa. Booklet featuring Squar-Vise, a general utility precision machine, to be used on profilers, pantograph machines, and surface grinders. Made of heat-treated steel and precision-ground square all over, the machine will stay square when clamping pressure is applied, and it can be clamped to the machine table in various positions. Two sizes are available, 4 1/2 and 6 inches. 26

BROACHING MACHINE — Colonial Broach Co., Detroit, Mich. Bulletin FW-55, describing the Colonial "4" Convertible broaching machine, which is capable of horizontal-pull broaching and vertical-push and pull-down broaching and press work. Photos show the multi-purpose, metal-working machine in horizontal and vertical operating positions. Descriptions of design, construction, and operating details are also contained. 27

NUT INSTALLATION DATA—National Machine Products Co., Utica, Mich. 24-page engineering data section for their catalogue was released by the company which includes a guide chart for calculating wrench torques for Standard, 12-Pointer, Marsden, and Huglock nuts, as well as complete information regarding all of the variables that must be considered in relation to bolt tightness and range torques. 28

AUTOMATION CYLINDERS — Hydro-Line Mfg. Co., Rockford, Ill. Bulletin No. 55 descriptive of series "S," compact all-steel precision-built cylinders for uninterrupted operation in heavy-duty automation service, with air pressures up to 200 pounds per square inch, or medium-duty hydraulic service up to 1000 pounds per square inch. Also included is automation cylinder accessory and engineering information. 29

CIRCUIT-BREAKER LOAD CENTERS—Trumbull Components Department of General Electric Co., Plainville, Conn. GEC-1309, a 12-page publication containing information on product features and applications of load centers, circuit-

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breakers and accessories, as well as data on ratings, specifications, wiring diagrams and dimensions for the load centers. . **30**

PNEUMATIC BAR FEED—Bar Feed Division of Lipe-Rollway Corporation, Syracuse, N. Y. 24-page booklet explaining how unit keeps pace with time, feeds bar stock continuously into single-spindle screw machines, turret lathes, centerless grinders, abrasive-wheel cut-offs, punch presses, cold-headers, die machines, and other equipment for periods up to eight hours. **31**

TUMBLING ABRASIVE—Simonds Abrasive Co., Philadelphia, Pa. Folder on Borolon, an aluminum-oxide tumbling abrasive, describing aluminum-oxide lumps and grain for barrel finishing a wide variety of parts and materials. Used for deburring, putting a radius on small parts, and precision finishing. **32**

MAINTENANCE AID FOR CLOSED WATER HYDRAULIC SYSTEMS—E. F. Houghton & Co., Philadelphia, Pa. Bulletin describing features and performance characteristics of a lubricating and rust-preventing additive developed by the company to aid pump and valve performance and give smoother operation of equipment. Complete application data and several case history reports are included. **33**

CAST ALLOY CUTTING TOOLS—Crobalt, Inc., Ann Arbor, Mich. Catalogue 55, explaining in 8 pages use of cast-alloy cutting tools including solid square, rectangular and round tool bits, solid cut-off blades, tipped tool bits, and inserts for vertical tube holders. Special inserted-tooth milling, boring, and reaming blades are also shown. **34**

ELECTRIC VALVES—Skinner Electric Valve Division of Skinner Chuck Co., New Britain, Conn. Catalogue giving information on solenoid-operated valves and describing five basic electric valves with their possible variations. Material explains how to choose the correct valve for various applications and is illustrated by photographs and charts. **35**

BENCH GRINDERS, ARBORS, AND SANDING DISCS—Poly Products Co., Monrovia, Calif. 8-page catalogue describing the company's line of bench grinders, sanding discs, and ball-bearing mandrel construction of saw, shaper, lap, and adapter arbors. Publication provides specifications, applications, dimensional sketches, and illustrations of the equipment. **36**

CENTRALIZED LUBRICATION SYSTEMS—Farval Corporation, Cleveland, Ohio. 8-page bulletin describing the advantages of Farval centralized lubrication systems for small machines or equipment with a limited number of bearings, and explaining how as many as twelve bearings can be reached at one time from a single grease gun connection. **37**

SCREWDRIVER SELECTION—Bridgeport Hardware Mfg. Corporation, Bridgeport, Conn. Wall chart listing and describing eleven types of screwdrivers, so that the right size for any job can be more easily selected. There are separate tables for wood-screws showing what type and size screwdriver to use for each shank size and length. **38**

FACE-MILLING CUTTERS—Lovejoy Tool Co., Springfield, Vt. 43-page catalogue giving descriptions of types A, H, J, L, and C face-milling cutters, with charts which show specifications, applications, and catalogue number of each type. Photographs and drawings are also included. **39**

STANDARD WASHERS—Master Products Co., Cleveland, Ohio. Catalogue containing listings on sixteen types of standard washers, in addition to concave and cupped type expansion plugs, wide rim and narrow rim machinery bushings, special tapped nuts, and ball-bearing assemblies. It also includes drawings of forty-eight designs in special washers. **40**

VALVE REMOTE CONTROL SYSTEMS—Stow Mfg. Co., Binghamton, N. Y. Bulletin 553 containing 20 pages of information on flexible shafting, standardized valve operating gear for reach rods, and geared joints. This Design Manual offers selection for any valve remote control installation. **41**

PLATING PROCESSES—Hanson-Van Winkle-Munning Co., Matawan, N. J. Bulletin PP-100, containing 4 pages listing 261 products which are useful for chemical and equipment requirements in the metal finishing industry. Plating and cleaning processes and their applications are also described. **42**

O-RINGS—Stillman Rubber Co., Culver City, Calif. Catalogue listing various sizes of O-rings. Permadizing, a rubber-to-metal bonding process is described, as well as the company's method for sealing O-rings in individual pouches to meet military requirements. Illustrations are included. **43**

LIST OF AMERICAN STANDARDS—American Standards Association, New York City. The 1955 edition is a 48-page publication listing and indexing about 1500 American Standards. Included are 153 mechanical, 272 electrical, 158 safety standards, and letter symbols and abbreviations, and others. **44**

SINGLE-POINT PRESSES — Cleveland Crane & Engineering Co., Wickliffe, Ohio. Catalogue 2019-A descriptive of the new Steelweld single-point presses which range in size from 150 tons and up. Bolster areas start with 30 by 36 inches. Features and specifications are given. **45**

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When you're offered substitutes for Gargoyle D.T.E. Oils, remember these facts—

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Remember, too, you get the world's greatest lubrication engineering service—*at no extra cost*—when you insist on Gargoyle D.T.E. oil. Why accept less? Call us today!

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SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

PRODUCTO MACHINE CO., Bridgeport, Conn., has opened a branch assembly warehouse at 214 Rock Hill

J. Brandon Shaw, who has been appointed branch manager of the Producto Machine Co.

Road, Bala Cynwood, Pa. J. BRANDON SHAW has been named branch manager. Mr. Shaw has had ten years' sales experience with the company.

LOUIS G. HELMICK, JR., has been elected vice-president of the Joy Mfg. Co., Pittsburgh, Pa. He joined the company in 1947 as production control manager at the company's Franklin, Pa., plant and was later named manager of the plant at Claremont, N. H. He became manager of manufacturing in 1954. His headquarters will be located in the organization's executive offices in Pittsburgh.

ROBERT C. LINDBERG has been made superintendent of production at Firth-Loach Metals, Inc., McKeesport, Pa. WILLIAM C. SEITZ has been appointed manager of research and development.

J. D. ROLLINS has been appointed vice-president of engineering of the American Bridge Division, United States Steel Corporation, Pittsburgh, Pa.

STANDARD PRESSED STEEL CO., Jenkintown, Pa., has purchased the neighboring plant of the Harry A. Prock Cabinet Co. It is the second major expansion for the company which produces precision fasteners, aircraft specialties, and shop equipment.

YOUNG TESTING MACHINE CO., Bridgeport, Pa., announces the formation of the YOUNG MACHINE TOOL DIVISION. This new division will manufacture horizontal boring, drilling, and milling machines; vertical boring mills; planers, and planer shapers.

JOHN A. SHOEMAKER has been appointed a representative by the Horsburgh & Scott Co., Cleveland, Ohio. His office is located at 53 Crickett Ave., Ardmore, Pa. Mr. Shoemaker's territory includes the southeastern corner of Philadelphia, the lower half of New Jersey, and the states of Delaware and Maryland.

DR. JAMES T. EATON has been elected vice-president of production of the E. F. Houghton & Co., Philadelphia, Pa. Dr. Eaton joined the company in 1937 and has been director of research. In his new position, he will assume responsibility of the company's oil manufacturing plants, and will continue to head the research staff.

Texas, Washington, D.C., and Alabama

RALPH R. BALDENHOFER, treasurer of the Thompson Grinder Co., Springfield, Ohio, has been appointed director of the metal-working equipment division of the Business and Defense Services Administration,

Ralph R. Baldenhofer, director of the metal-working equipment division of B. D. S. A.

U. S. Department of Commerce, Washington, D. C. Mr. Baldenhofer is on leave from his company to take this government post.

UNITED STATES STEEL CORPORATION, New York City, announces the following executive appointments in its Oil Well Supply Division, Dallas, Tex.: M. F. HAZEL has been named vice-president of sales; ALEX QUAYLE succeeds Mr. Hazel as director of engineering; LLOYD E. TRACY has been named vice-president of merchandise; RALPH W. RAGER was appointed vice-president of manufacturing; DAN H. BARR becomes assistant to vice-president of sales; and GORDON H. AMSTUTZ becomes assistant to vice-president of manufacturing.

LOCKE H. JONES, JR., has been appointed machine tool sales manager for Moore-Handley Hardware Co., Inc., Birmingham, Ala.

Coming Events

APRIL 13-15—Tenth annual Meeting and Lubrication Exhibit of the AMERICAN SOCIETY OF LUBRICATION ENGINEERS at the Hotel Sherman, Chicago, Ill. Administrative secretary, William P. Youngclaus, Jr., 84 E. Randolph St., Chicago 1, Ill.

MAY 16-20—SIXTH NATIONAL MATERIALS HANDLING EXPOSITION at International Amphitheatre, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 31-JUNE 3—THIRD BASIC MATERIALS EXPOSITION to be held at Convention Hall, Philadelphia, Pa. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

JUNE 8-10—Third Annual Welding Show under the sponsorship of the AMERICAN WELDING SOCIETY to be held at the Municipal Auditorium, Kansas City, Mo. National secretary, Joseph G. Magrath, 33 W. 39th St., New York 18, N. Y.

SEPTEMBER 6-17—METALWORKING MACHINERY AND EQUIPMENT EXPOSITION to be held at the Coliseum, Chicago, Ill. Further information can be obtained from Chester L. Wells, general manager, 2689 East Overlook Road, Cleveland 6, Ohio.

SEPTEMBER 6-17—Machine Tool Show sponsored by the NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION to be held at the International Amphitheatre, Chicago, Ill. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

SEPTEMBER 6-17—PRODUCTION ENGINEERING SHOW, coinciding with the Machinery Tool Show, to be held at the Navy Pier, Chicago, Ill. For further information, write to Clapp & Poliak, Inc 341 Madison Ave., New York 17, N. Y.

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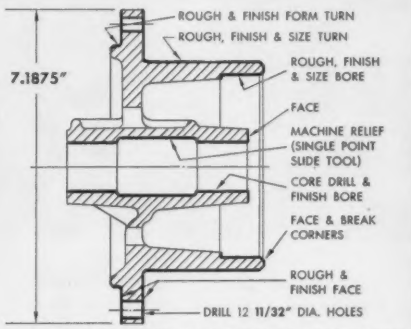
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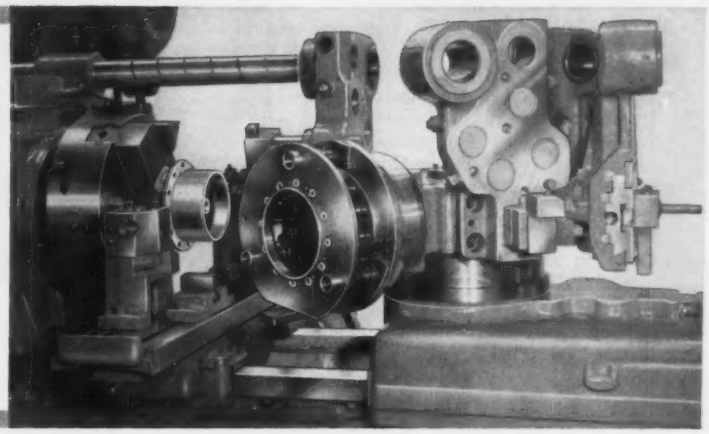
ROUGH, FINISH & SIZE TURN
ROUGH, FINISH & SIZE BORE
FACE
MACHINE RELIEF (SINGLE POINT SLIDE TOOL)
CORE DRILL & FINISH BORE
FACE & BREAK CORNERS
ROUGH & FINISH FACE
DRILL 12 11/32" DIA. HOLES

MACHINED SURFACES ARE INDICATED BY HEAVY LINES



using a 5-DELX POWER-FLEX Automatic Turret Lathe

The cast iron bearing spider shown required machining of twenty separate surfaces, plus accurate drilling of twelve, 11/32" dia. holes. A P & J Model 5-DELX POWER-FLEX performed all operations in a single, fully-automatic turret cycle . . . floor-to-floor time was just 7.96 minutes.

P & J Tooling Engineers estimated tooling and production costs from the piece drawings, and produced tools to take full advantage of the automatic speed and feed changes available in the Model 5-DELX. The result was high-quality production — with operator fatigue reduced and the number of machines per operator increased.

The Model 5-DELX POWER-FLEX — like all P & J Automatic Turret Lathes — provides the power, flexibility and automatic operation needed for sustained high-volume precision production.

Send today for Model 5-DELX Bulletin No. 131. If your production requires Automatics of smaller or larger capacity, you will find the right machine in the complete P & J line of Automatic Turret Lathes. Specific information on request.

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PRECISION PRODUCTION TOOLING FOR OVER FIFTY YEARS

Special Lathe Permits Versatility in Testing Carbide Tools

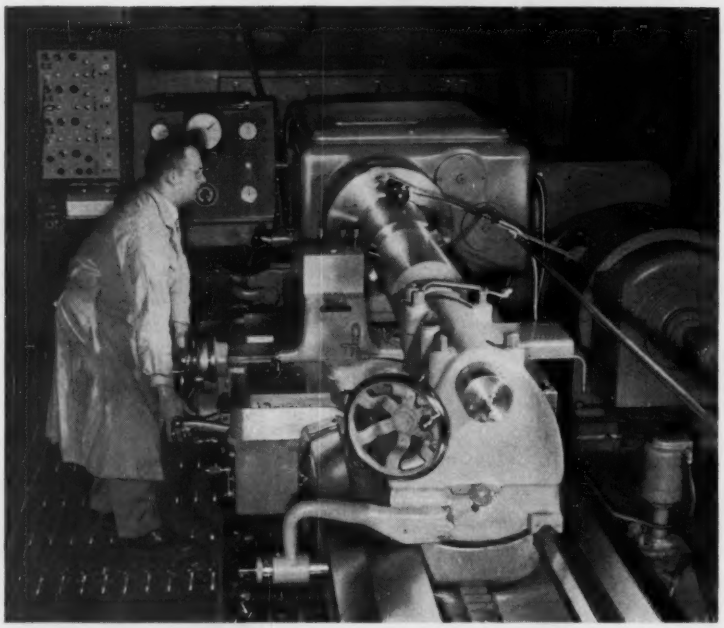


Fig. 1. Special lathe used to test machinability with carbide tools, determine tool life, test holders, and provide machining data.

VERSATILITY in machinability testing with carbide tools has been made possible by the installation of a specially built 125-H.P., 32-inch LeBlond lathe at the Carboloy Department of General Electric Co., Detroit, Mich. The lathe, seen in Fig. 1, has the capacity, rigidity, and wide range necessary to provide accelerated break-down of experimental tools under both high-speed finishing cuts and slower speed, heavy roughing operations. The lathe will be used to test the machinability of different materials with various grades of cemented-carbide tools, determine carbide life under all conditions, test various types of tool-holders, and provide additional data on speeds and feeds in machining with carbide.

The lathe is equipped with a General Electric Variator for variable-speed drive, the unit consisting of a 125-H.P. alternating current motor driving a generator. Direct-current output of the generator is controlled by a potentiometer on the control panel which varies the speed of the motor up to a maximum of 1380 R.P.M. Speed is maintained by electronic feed-back systems, with 1 per cent variation or less when full load is applied. Up to 200 H.P. can be delivered for fairly long periods of time, and up to 350 H.P. can be supplied before the motor will stop.

To facilitate the transmission of horsepower for testing tools in heavy roughing operations, four-speed gearing capable of transmitting 75 to 100 H.P. at spindle speeds from 42 to 700 R.P.M. were incorporated in a standard lathe head. The number of gears normally used for thirty-six speed change heads was reduced, and the size of the gears increased—some gears weighing as much as 180 pounds. Direct belting to the spindle permits higher speeds (700 to 1400 R.P.M.) to be obtained without gears, and up to 140 H.P. to be transmitted. No clutch is used in the drive system, thus eliminating possible slippage or chatter from this cause. The spindle is started and stopped by electronically controlled acceleration and braking of the drive motor. A special feed quadrant gear can be used for feeds down to 0.002 inch per revolution.

Complete instrumentation for machinability testing has been included in the control panel. A high- and low-scale horsepower meter is located next to an overload indicating light. A tachometer generator has a wheel riding on the periphery of the workpiece, and surface speed is shown directly in feet per minute on a three-range instrument. The elapsed time of cutting tests is measured by an electrical timer. Three jacks connected to the motor speed, work surface speed, and horsepower indicating instruments, permit recording these factors on a Sanborn four-channel

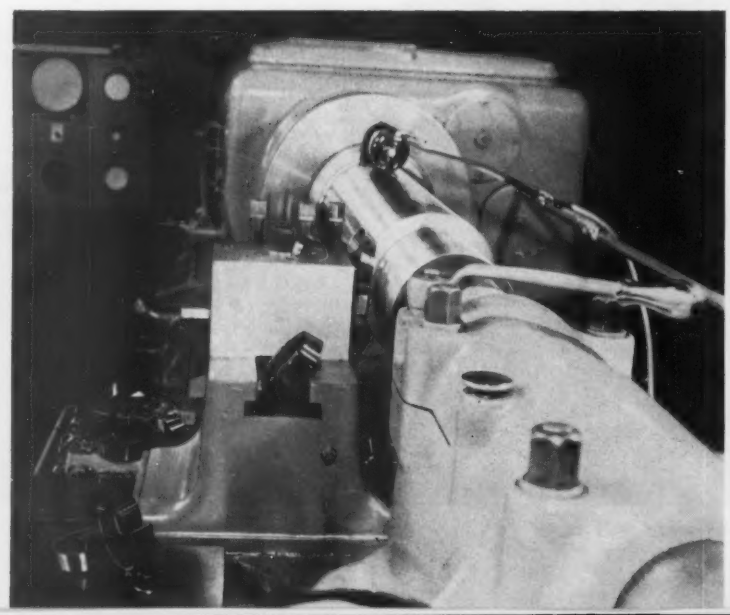
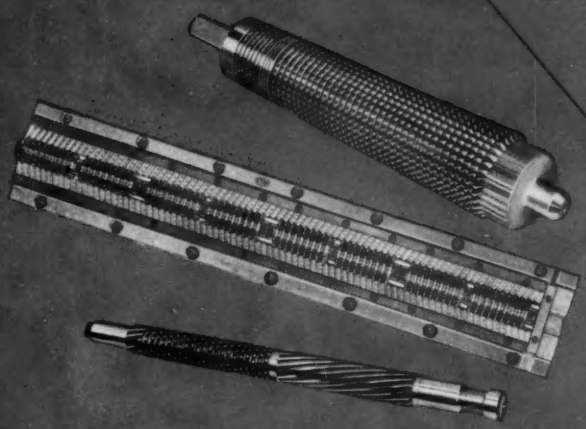
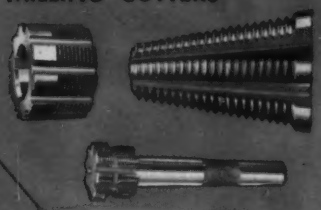


Fig. 2. Close-up view of special lathe, Fig. 1, being used to turn S A E 1045 steel at 200 feet per minute with 1-inch depth of cut and 0.083-inch feed rate.

BROACHES



GROUND MULTIPLE THREAD MILLING CUTTERS



FORM-RELIEVED MILLING CUTTERS

"Production-Proved" CUTTING TOOLS BY Continental

The cutting tools supplied to industry by Continental are *Production-Proved Tools.* Here's why:

Continental is an Ex-Cell-O subsidiary. As such, it can try out new tool designs, new methods, in Ex-Cell-O's big parts production shops. There could be no finer "proving ground."

Thus, Continental offers *Production-Proved Cutting Tools.* They are time-and-cost savers.

Call in your Ex-Cell-O representative or contact Continental in Detroit today for information about them.

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Division of Ex-Cell-O Corporation, Detroit 32, Mich.

CTW

SINGLE POINT TOOLS

FORM TOOLS

53-42

oscillograph tape for closer simultaneous study.

Typical of the many tests that have been made thus far is the set-up shown in Fig. 2. Here, an S A E 1045 steel bar, 12 1/2 inches in diameter by 48 inches long, having a Brinell hardness between 200 and 225, is being turned at 200 surface feet per minute. Depth of cut is 1 inch, and the feed rate is 0.083 inch per revolution, with 96 H.P. being required. A mechanically clamped, Carboloy Grade 370 tool bit is employed for this operation, with a Carboloy Grade 55A pad under the bit. One fact that has been emphasized by the various tests conducted thus far is the savings in power resulting from heavy cuts when a machine of sufficient power is available. For example, in one instance the horsepower required to remove 1 cubic inch of material per minute has been reduced from 0.87 to 0.5.

Tool Engineers Present Honors and Install New Officers

New national officers were installed and the Society's first honor awards were presented at the annual banquet of the American Society of Tool Engineers held recently in Los Angeles, Calif. Dr. Harry B. Osborn, Jr., technical director of the Tocco Division, Ohio Crankshaft Co., Cleveland, Ohio, was elected president to succeed Joseph P. Crosby, vice-president of the Lapointe Machine Tool Co., Hudson, Mass.

Ernest R. Breech, chairman of the board of Ford Motor Co., received the 1955 ASTE Progress Award. Philip M. McKenna, president of Kennametal, Inc., Latrobe, Pa., received the ASTE Engineering Citation. His citation was for "original and important contributions to the development of carbide materials and tools and their application in the machining and forming of manufacturing materials . . . able worker for the advancement of science."

New officers of the Society, in addition to Dr. Osborn, are: H. C. McMillen, plant manager, Philco Corporation, Bedford, Ind.—first vice-president; H. E. Collins, manager, Process Engineering Department, Hughes Tool Co., Houston, Tex.—second vice-president; R. C. W. Peterson, president and owner, Peterson Engineering Co., Toledo, Ohio—third vice-president; Wayne Ewing, president, Arrowsmith Tool & Die Co., Inc., Los Angeles, Calif.—fourth vice-president; Harold D. Long, president, Scully-Jones & Co., Chicago, Ill.—treasurer; John X. Ryneska, General Electric Co., West Lynn, Mass.—secretary.

Newly elected national ASTE officers (seated, left to right) Dr. Harry B. Osborn, Jr.—president; H. E. Collins—second vice-president; H. C. McMillen—first vice-president; (standing, left to right) R. C. W. Peterson—third vice-president; Wayne Ewing—fourth vice-president; John X. Ryneska—secretary; Harold D. Long—treasurer

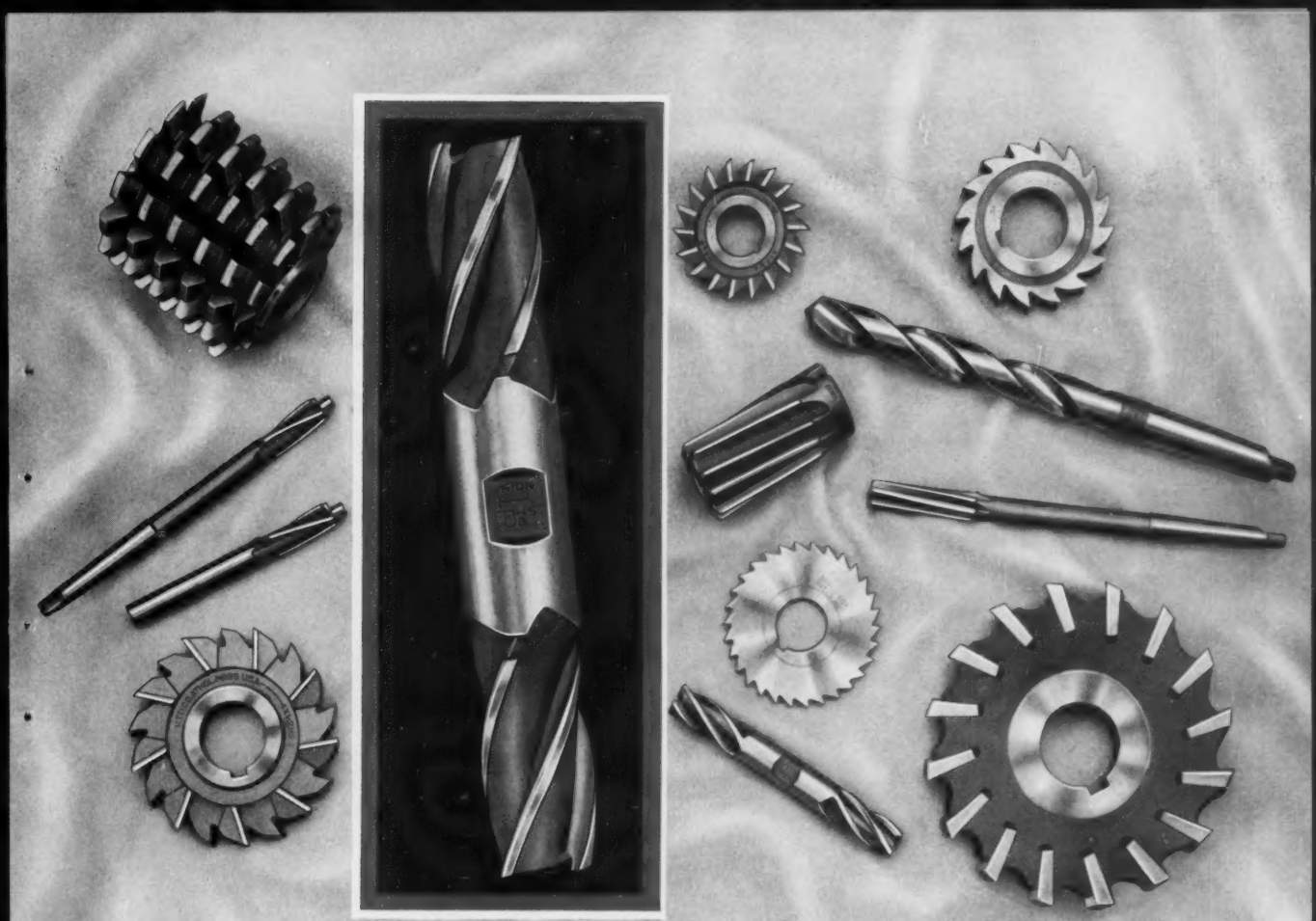
Hoover's Boyhood Home Being Restored

The boyhood home of Herbert Hoover in Newberg, Ore., will soon become a national shrine. A group of former fellow townsmen and friends of the ex-President, organized as the Herbert Hoover Foundation, have purchased the site and are now in the process of restoring and refurnishing the property. Newberg already has a park named for its favorite son, and the highway from Newberg to Portland also bears his name. Mr. Hoover has been invited by the Oregon Legislature to attend the opening of the home on his eighty-first birthday, August 10, 1955.

Born in West Branch, Iowa, Herbert Hoover lost his father at the age of six, his mother when he was only eight, and lived until he was ten years old with his uncles, one in Indian territory, now Oklahoma, and one near West Branch. Another uncle, principal of a small Quaker school in Newberg, at this time arranged for young Hoover to live with him. There the boy who later was to win international fame as a mining engineer, humanitarian, and statesman spent his youth until matriculating at Stanford University.

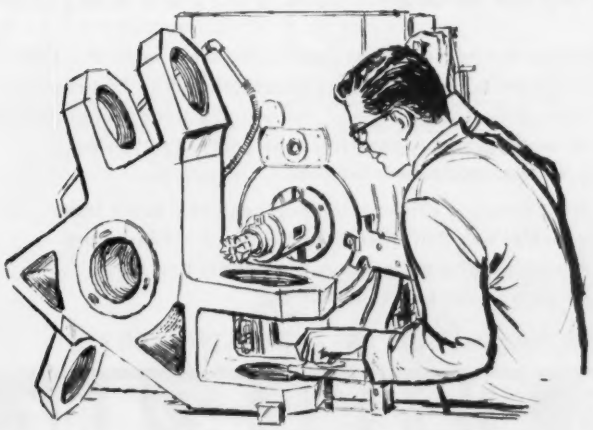
It is the intent of the Foundation to restore the home and its furnishing to the original condition, so far as that is possible. Fortunately, many pieces of furniture in the home at the time, as well as some photographs, portraits, and documents, have become available. The Foundation feels that its restoration will be entirely authentic. It has had the cooperation of the family who purchased the property from Mr. Hoover's uncle and occupied the house for a number of years in its unchanged condition.

To date, the Foundation's activities have been little publicized. Since its work is supported entirely by voluntary contributions, and since no fund-raising campaign has been undertaken, its resources are greatly limited. To those who respect and admire this great American for the long and devoted service given to his country, this offers an opportunity to express individual appreciation. Contributions for the restoration and maintenance of the home should be forwarded to: The Herbert Hoover Foundation, c/o Dr. B. B. Barker, 3438 S.W. Brentwood Drive, Portland, Ore.



IN THE METAL WORKING INDUSTRY, IT'S

UNION



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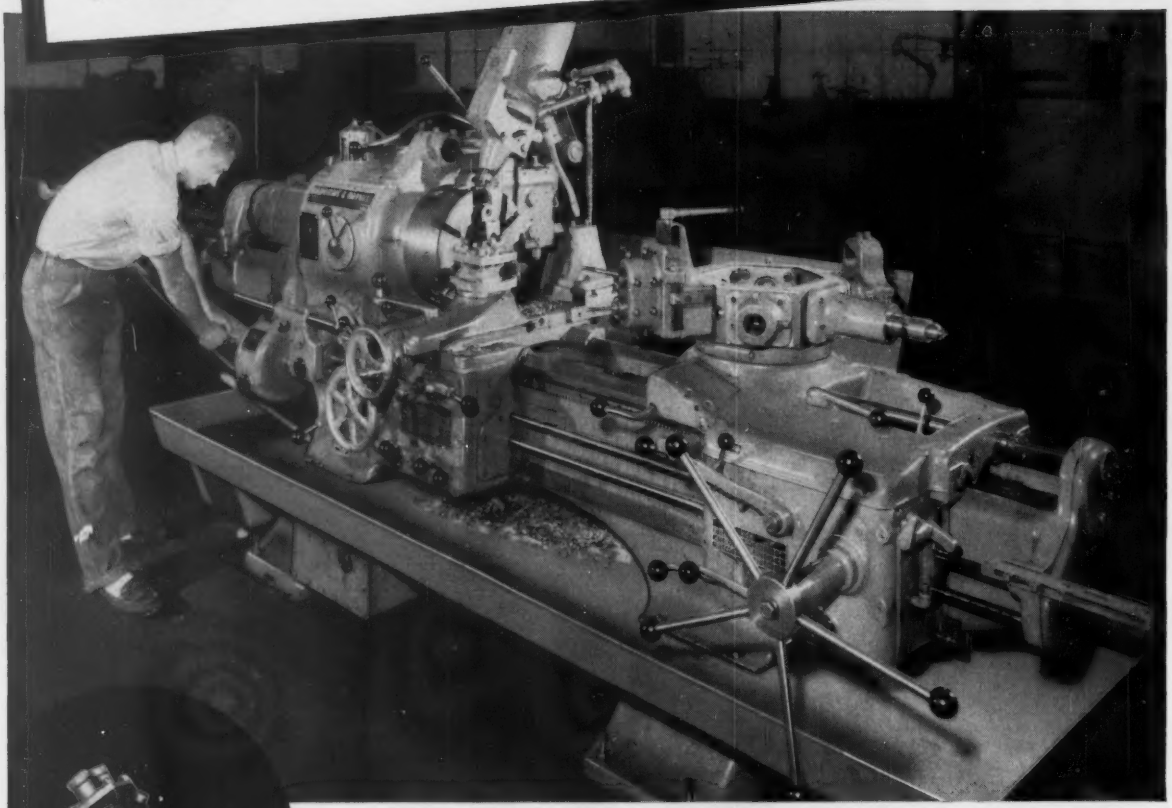

Photographs courtesy of
The Cleveland
Pneumatic Tool Company

...on BARDONS & OLIVER Turret Lathes

Illustrated at the left is a flight control actuator, parts of which are made on Bardons & Oliver turret lathes. The Cleveland Pneumatic Tool Company, the world's largest manufacturer of landing gear, appreciates the necessity of using precision made machine tools.

Next time you consider the purchase of a turret lathe . . . consider one that offers the finest in precision workmanship. Why not send us blue prints and let us quote on your particular needs.

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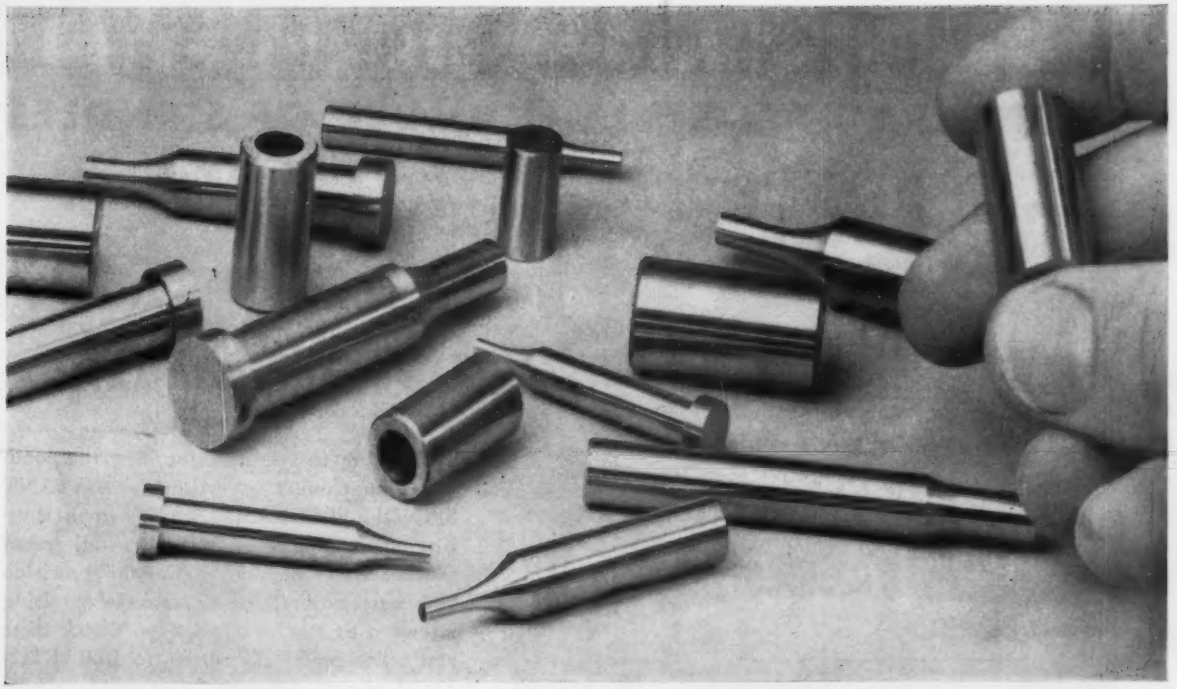


How the country's largest exclusive producer of punches and dies changed complaints to contracts

. . . with Graph-Mo® steel

PORTER Precision Products, Cincinnati, Ohio, is the country's largest exclusive manufacturer of punches and dies—37,000 different sizes in stock. Formerly, Porter produced these products from water-hardening and other high-carbon tool steels, but found that such steels presented distinct disadvantages. For example, they distorted in heat treating, were relatively expensive and difficult to machine, and did not meet customers' demands for longer life.

With a view to correcting these problems, Porter engineers adopted Graph-Mo®—one of four graphitic tool steels developed by the Timken Company—as a standard for the manufacture of punches and die buttons. Because it contains free graphite, Graph-Mo is easier to machine. And punches and dies made of Graph-Mo don't scuff or gall. From every aspect, Porter's adoption of Graph-Mo steel has proved eminently successful.

Graph-Mo outwears ordinary tool steels on an average of three to one. Millions of tiny particles of diamond-hard carbide—one of the most wear-resistant substances known—give Graph-Mo steel longer service life.

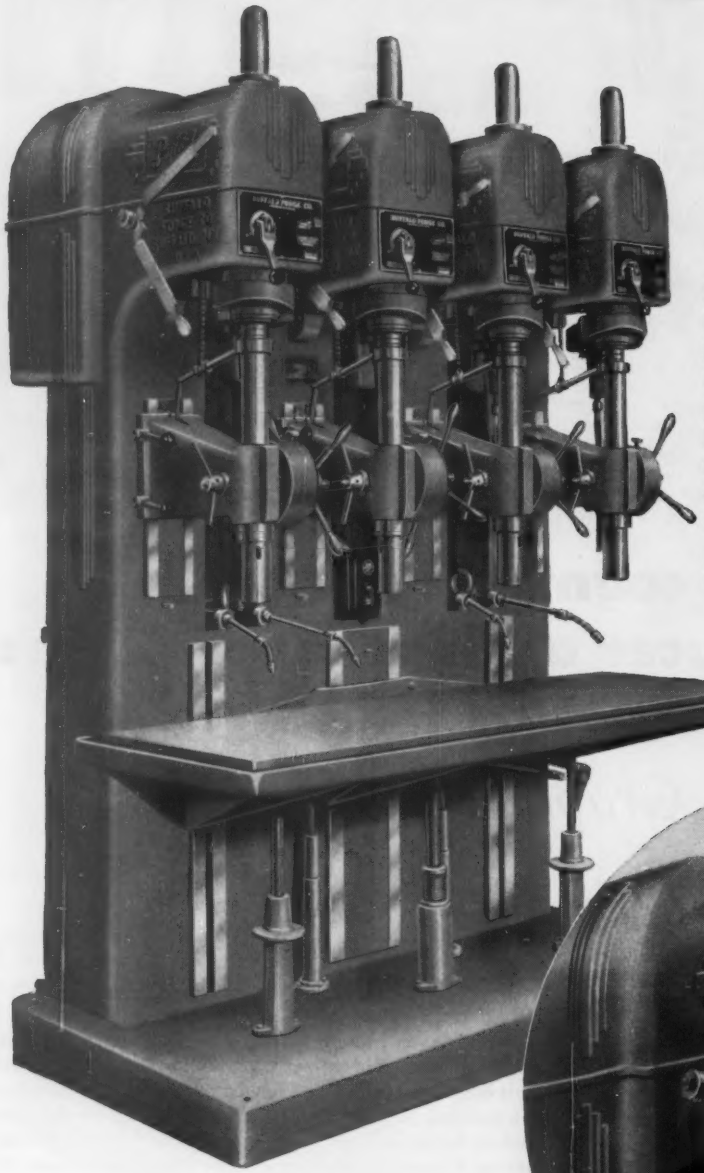
Graph-Mo may be the solution to *your* punch and die problems. For more information about all four graphitic steels developed by the Timken Company, and their uses in dies, punches, gages, and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

ON THESE PAGES — THE ANSWER

NAME CAPACITY—STYLE—NUMBER OF SPINDLES



"BUFFALO" RPMster — ANSWER TO THE PRODUCTION MAN'S DREAM

For the shop that demands the finest, this popular machine offers "everything"—INSTANT SPINDLE SPEED SELECTION without shutting off the motor—back gearing—all-geared power feed — the famous "Buffalo" precision ball bearing spindle—easy action table raising screws with hand scraped ways. Check these and other practical features in BULLETIN 3257A, your copy on request. Here's a machine typical of the "Q" Factor* value you get when you specify "Buffalo".

BELOW: handle on left gives instant speed selection — handle on right shifts into back gear, on the RPMster.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

THE MACHINE TOOL SHOW
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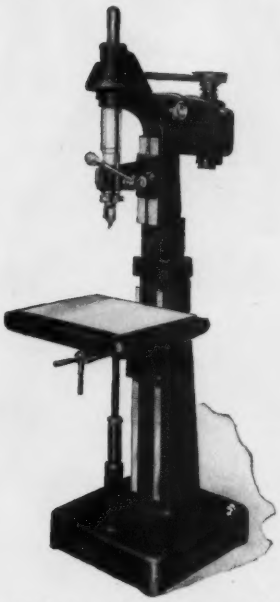
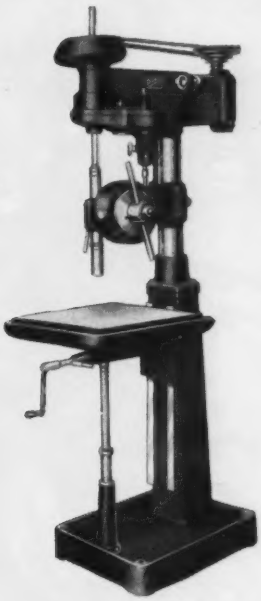
TO YOUR DRILLING PROBLEM

—SPECIAL FEATURES—"BUFFALO" BUILDS IT!

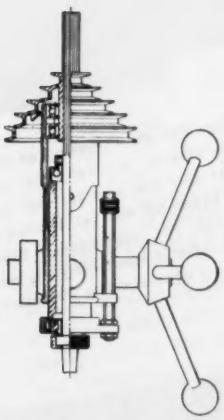


FOR DRILLING PRECISION PARTS the "Buffalo" high-speed No. 14 Drill handles from ⅜" down to the smallest commercial size drills. Bench or pedestal models, one to six spindles. WRITE FOR BULLETIN 2730G.



SENSITIVE OR POWER FEED; 8", 12" or 15" overhangs; models up to 6 spindles with coolant system—the ⅞" capacity No. 16 "Buffalo" Drill is a best buy in its size. WRITE FOR BULLETIN 2730G.

PRODUCTION FAVORITE! The husky 1" capacity No. 18 Drill offers 19 models. Choice of number of spindles, floor, pedestal and bench models to meet the most particular requirements. WRITE FOR BULLETIN 3123.



LASTING ACCURACY, EASY OPERATION! The "Buffalo" spindle is turned, ground and polished of high grade steel; turns smoothly and without end-play on precision ball bearings. Its six splines are fitted so accurately to the broached pulley that up-and-down motion is almost effortless.

ALL-AROUND RUGGED ½" DRILL — the "Buffalo" No. 15 is available in a very wide choice of arrangements, attachments. Single or multiple heads. A true production tool. WRITE FOR BULLETIN 2963G.

EASY HANDLING BIG-JOB DRILL — the 2" capacity No. 22 Drill stands 96" high, yet handles as easily as smaller, sensitive drills. Available with power feed. One to four spindles, round column or pedestal. BULLETIN 2989G.

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ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

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What an Industrial

CASE HISTORY No. 1

A Canadian plant* making an aluminum bomb nose on a turret lathe was able to get only one part per tool grind on the form tool. A heavy cut was being taken and a good finish required. We recommended SuperKool 1-M Cutting Oil. A cutter is now lasting one and one half shifts and giving approximately 200 pieces per grind.

CASE HISTORY No. 2

A midwestern company* machining 6150 steel forgings ran out of Dasco Super Soluble Base Oil and substituted a local product. Speed had to be immediately reduced as much as possible and lighter cuts taken. However, the tool still heated up and chips continued to come off blue. Dasco Super Soluble was reordered and once again chips came off bright, speeds were high and heavier cuts are again possible.

CASE HISTORY No. 3

A Canadian manufacturer* of paint trays for roller type paint applicators was applying drawing compound to the die after every other paint tray formed. Of light gauge tin plate (.015) the trays are formed in one drawing operation. Dasco No. 26 Drawing Compound was recommended. Consumption has been cut in half with Dasco No. 26 being applied after every fourth piece.

CASE HISTORY No. 4

Three large automotive plants* now use Stuart's Sturaco L-30 E.P. Slide and Way Lubricant for lubrication of machine tool gear drive units, lead screws and heavily loaded slides and ways. Sturaco L-30 has an extra high load carrying characteristic due to the addition of extreme pressure type additive materials and it has improved adhesive qualities.

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The D. A. Stuart Oil Company's modern laboratory is constantly at work analyzing industrial lubrication problems such as you may be experiencing. They know how to develop the industrial lubricant that is *just right for your job!* Have your shop analyzed now... call "the Man in the Barrel". With 90 years of specialized company experience behind him, he's your best guide to greater efficiency.

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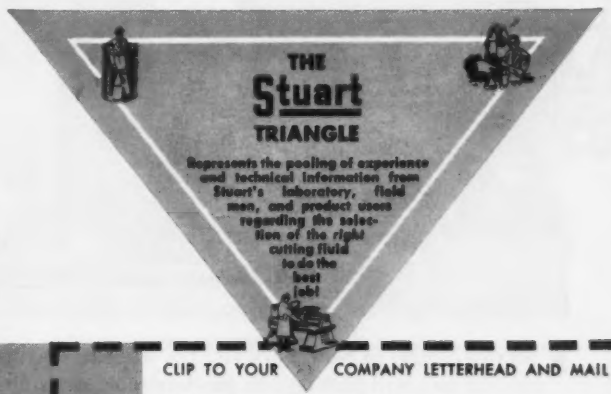
Include: Straight oil type cutting and grinding fluids, water-mix cutting and grinding fluids, drawing and stamping compounds, and lubricating oils and greases for gears, bearings and machine tool ways.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DO THEY SET TOLERANCES CLOSER THAN YOU CAN DELIVER?

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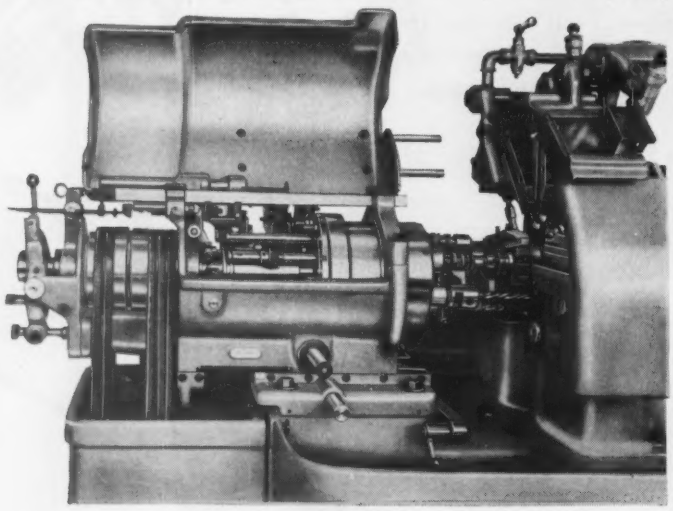
BECHLER
SWISS AUTOMATIC

Job sheets are specifying closer tolerances all the time. With Bechler Swiss automatics you can turn workpieces to within tenths. Furthermore, Bechlers are built in 2 different models—the latest with drum-turret is made in 3 sizes, the standard in 4—so you can get the one that fits your production needs (in short, you don't have to buy more machine than you want).

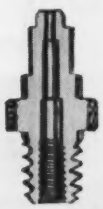
Bechler standard Swiss automatic—5 single-point tools for turning pins, staffs, arbors, shafts, pinions, and studs. Comes in 4 sizes with diameter capacities from 1/32" to 1 1/4". Maximum turning length is 9".

Stainless steel shaft 3/8" dia., 2 3/4" long, diameters held to .0003", concentricity .0005", finish 16 micro inch.



Bechler drum-turret Swiss automatic—12 work stations include 5 cross tools, 6 turret positions, and 1 pick-up position. For machining hubs, fittings, valves, housings, couplings, nozzles or other intricate precision parts with multiple end operations including internal and external threading. Comes in 3 sizes with diameter capacities from 1/32" to 1 1/4". Maximum turning length is 9".

- Service centers in New York and Los Angeles—factory trained men will plan layouts, produce tools, cams, and make set-ups.
- Complete stock of attachments, spare parts, and cams.



Enlarged cross-section of a nozzle: 3/8" dia., 3/4" long, three holes of different sizes, internal and external thread, and knurl.

Let us recommend the right Bechler for your precision job. Or, write for bulletin.

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

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Using our facilities as *your gear department* puts our entire organization on your team with production-line precision. Gears—constantly to your specifications—arrive on schedule, and you are relieved of the responsibilities of building and maintaining a gear department equal to your requirements in *know-how* and production facilities.

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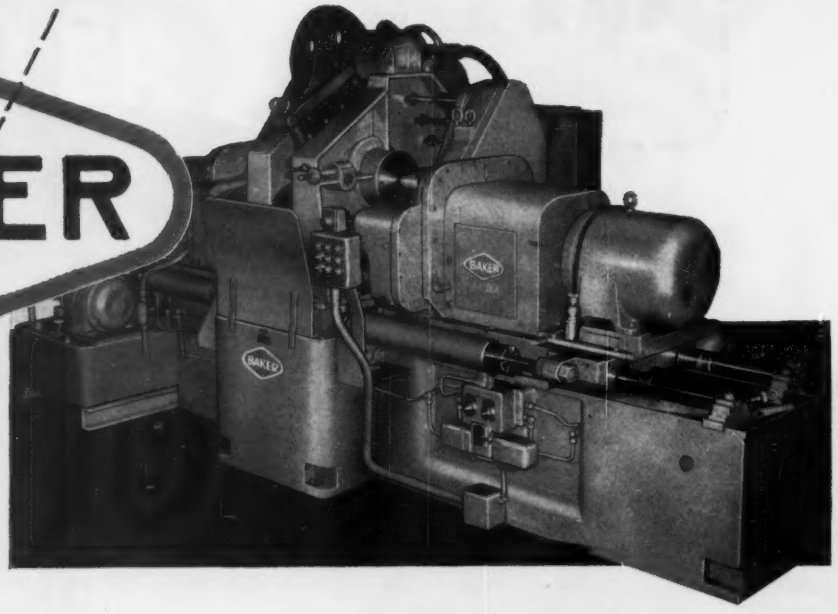
SLASH PRODUCTION COSTS!

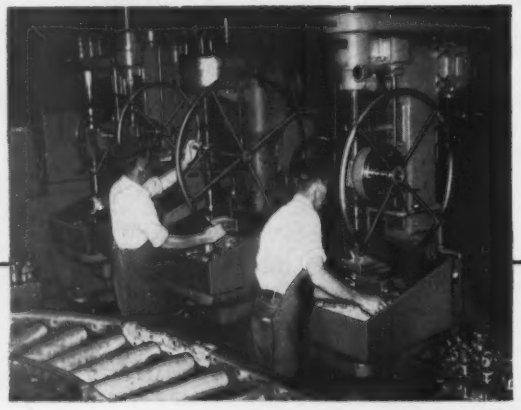
New BAKER Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload

THE OLD METHOD —



2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY .. with a NEW BAKER 'Special'

WRITE REGARDING YOUR SPECIFIC JOB PROBLEMS . . .

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

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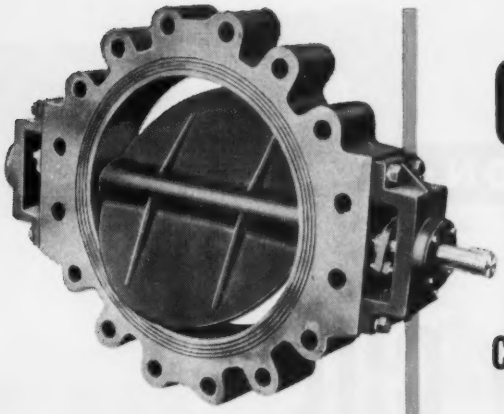


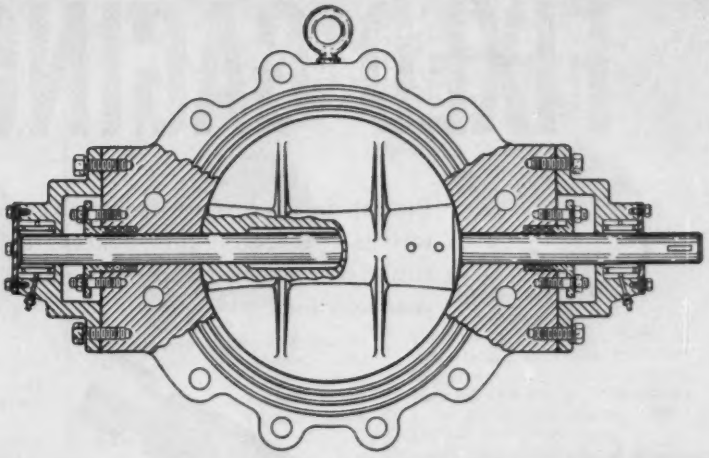
ORANGE ROLLER BUSHINGS

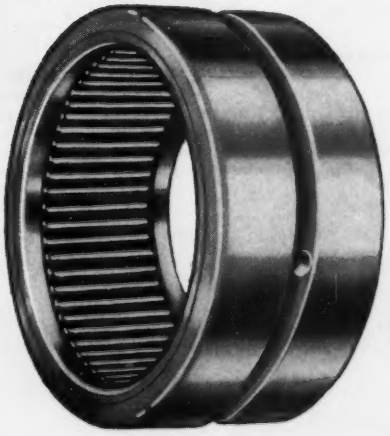
assure smooth, friction-free operation of Thru Shafts in

CONTINENTAL BUTTERFLY CONTROL VALVES

"15 years of Satisfactory Service" reports Continental Equipment Company, Coraopolis, Pa.

Continental Butterfly Valves, in sizes from 2" to 96" dia., are used for manual or automatic control of all types of fluids. An important feature is the continuous, one-piece shaft through valve body and disc to provide maximum disc support—maximum rigidity—and true alignment that eliminates binding. Compact, high-load Orange Roller Bushings at each end of the shaft help to maintain these operating features.





Stop friction and wear on rotating or oscillating shafts, pins and parts by installing Orange Roller Bushings. Exceptionally high load capacity in very small space permits more compact designs — provides smoother, quieter running — eliminates troubles and complaints in the field.

Many construction features of Orange Roller Bushings include electronic gauging of rollers for controlled uniformity; closer internal running clearances to minimize misalignment of rollers; finest bearing steel; all raceways through-ground; highest standards of heat-treating, finishing and inspection.

Specify Orange Roller Bushings wherever designs call for needle bearings. Consult our engineers on any application.

Available in stock sizes from ½" to 8" shaft dia., fully interchangeable with all standard heavy-duty needle bearings. Stocked and serviced in all principal industrial areas.

ORANGE
ROLLER BUSHINGS

Write for Engineering Data Book

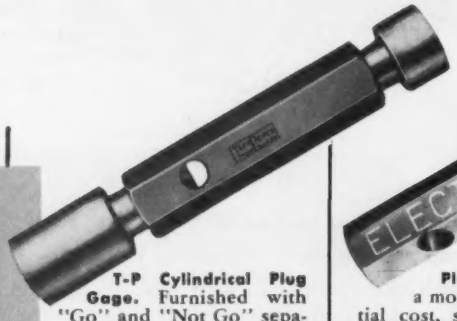
ORANGE ROLLER BEARING CO., Inc.
552 Main Street
Orange, N. J.

TIPS FROM TAFT-PEIRCE ON:

How to cut FIXED GAGING COSTS

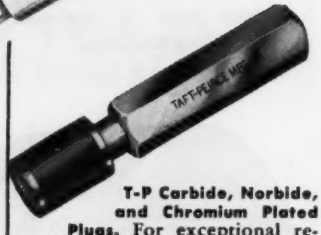
Picking the *right* gage for each job can result in substantial savings — in gaging time, upkeep, replacement and initial cost. Here are some comparisons that will help you to make your selection.

Plain Plugs



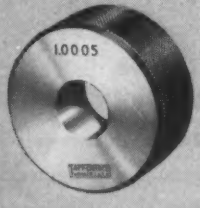
T-P Cylindrical Plug Gage. Furnished with "Go" and "Not Go" separately, or on opposite ends of handle. Progressive gage — with "Go" and "Not Go" on same end increases speed.

T-P Electrolized Plug Gages. With only a modest increase in initial cost, substantially longer wear life can be obtained with this exclusive surface treatment. Many users report up to 3 times longer gage life.



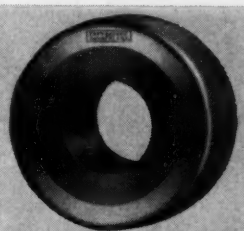
T-P Carbide, Norbide, and Chromium Plated Plugs. For exceptional resistance to abrasion or scratching. Maximum wear-life. Brittleness requires care in handling.

Plain Rings



T-P External Ring Gage. For reference purposes, setting air or other variable gages and accurate size control of parts.

T-P Chromium-Plated Ring. Lowers gaging costs on longer runs of highly abrasive materials or hardened steel. Provides up to 5 times more service.



T-P Norbide and Carbide Rings. For greatest wear-resistance. Available in Norbide and Tantalum or Tungsten Carbide. Brittleness requires careful handling.

THE TAFT-PEIRCE
WOONSOCKET,

Adjustable Snaps

T-P Plain Adjustable Snap Gages. Available with gaging pins, round or square buttons, and solid anvils in combination with buttons.

T-P Midget Snap Gages. Smaller in size and section, their light weight aids in gaging small or delicate parts. Maximum rigidity and stability are provided.

T-P Cemented Carbide or Norbide Snaps. For close tolerance work on abrasive materials. Gaging members tipped with Tungsten or Tantalum Carbide. Or with Norbide inserts, as shown.

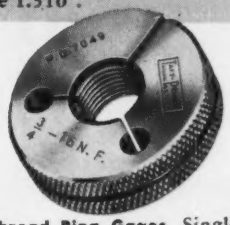
Thread Plugs

T-P Limit Thread Plug Gage. Available in Taper Lock or Trilock design. Taper Lock up to 1.510". Reversible from No. 0 to ½". Reversible Trilock above 1.510".

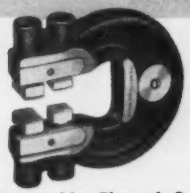
T-P Carbide Thread Plug Gage. For longer wear. Furnished both standard and special from #8 machine screw size up.

T-P Truncated Thread Set Plug Gage. Sets and checks thread gages with greater accuracy. Checks thread angle and O. D. Indicates wear, or oversize.

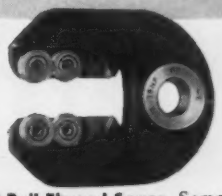
Thread Rings & Snaps



T-P Thread Ring Gages. Single unit clamping device simplifies setting, increases accuracy, eliminates distortion. Locks without changing pressure on ring.

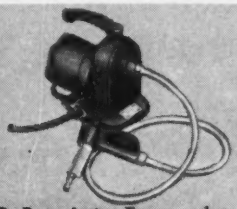


T-P Adjustable Thread Snaps. Faster than ring gaging, and just as accurate, they check lead, angle, and all other thread elements. Variable pitch diameter.

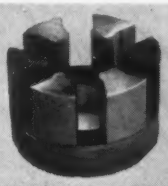


T-P Roll Thread Snaps. Same as Adjustable, with *rolls* for gaging members. Since gaging members rotate, wear is spread over greater surface and service life increased.

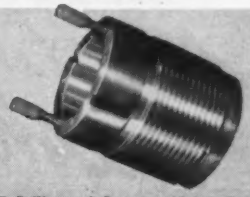
Special Gages



T-P Rotochek. Fastest thread gaging method. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages.



T-P Spline Gages. A special gage due to the diversity of individual requirements. Thousands of such special gages are made at Taft-Peirce every year.



T-P Thread Concentricity Gage. Checks size and location of internal threads. Another example of infinite variety of fixed gages made by T-P.

Gage Blocks

T-P Gage Blocks. For the ultimate in accuracy. Measures increments down to 0.00005". Available in small or large sets, or individually. Carbide Wear Blocks also available.

MANUFACTURING COMPANY
RHODE ISLAND

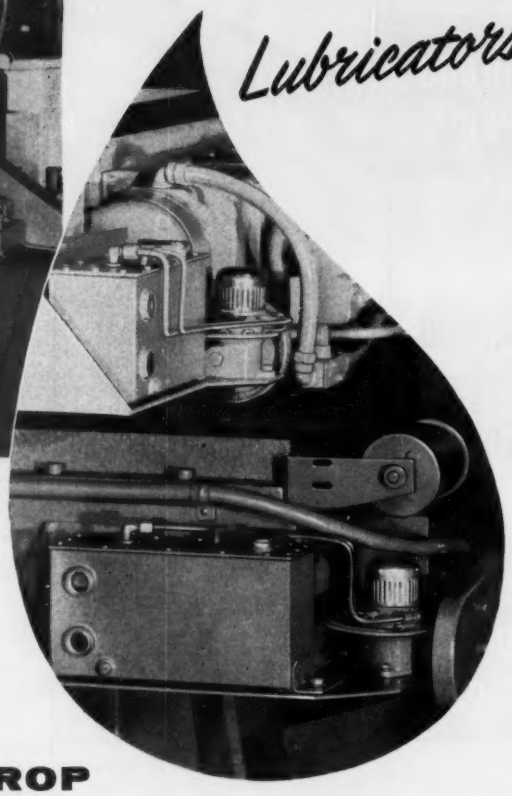
T-P means Top Precision

T P

For the complete story on these items, and many more, get your copy of the new Taft-Peirce Handbook.

MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED

...MADISON-KIPP *Lubricators*



Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois... Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

Fresh Oil...

BY THE MEASURED DROP

...from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

kipp

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WIS., U.S.A.

● Skilled in Die Casting Mechanics ● Experienced in Lubrication Engineering ● Originators of Really High Speed Air Tools

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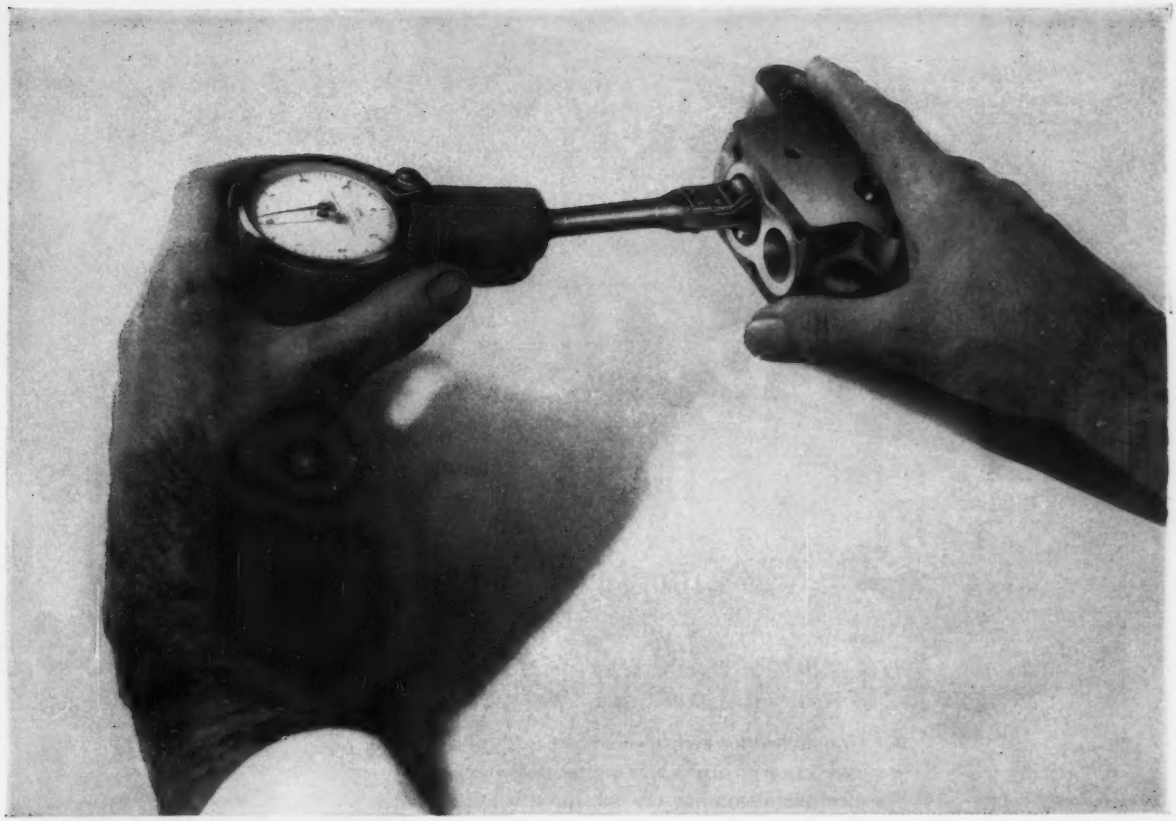


Just How Accurate Must A Gage Be To Be Accurate?

Precision is relative. A specified dimension of 1.625" is never exactly 1.625" on the workpiece. That's why you use tolerances.

You use gages to find out how closely your work comes to the specification 1.625". But, gages themselves can also vary in their accuracy. So *they* need tolerances, too.

And that is what we want to talk about. We put tolerances on the accuracy of the gages we make. We make them to an accuracy standard that experience indicates is "high grade" and acceptable to those who have a "high grade" regard for the dimensional quality of their products. We also build into them a durability that makes sure that our gages will maintain that accuracy standard for a long, long time.

For instance, some gage users would specify steel contacts on a gage like that shown above. We *can* supply steel contacts but *our* standard of accuracy calls for contacts of the hardest material — diamond. Why? Because the minute you start to use a gage the contacts begin to wear. You may have saved a few dollars on the soft contacts but soon the gage begins to change its accuracy. You have to check it oftener and reset it. If you forget, you are soon passing out-of-tolerance work. Another example: The above gage could be made to centralize itself positively, but it would not gage as accurately.

These are only two illustrations. We know that accurate gages require certain basic fundamentals in their design. — Moreover, they should not be "multi-purpose" or Rube Goldberg gages difficult to adjust and of doubtful accuracy.

We *know* these things are true. That's why Federal insists on adherence to *proven* principles of gage design.

Ask our Engineers for recommendations to meet your gaging requirements.

FEDERAL PRODUCTS CORPORATION

5114 Eddy Street, Providence 1, R. I.

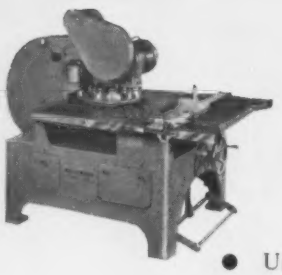
Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

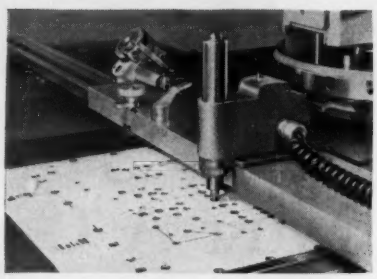
SAVE 90% with a WIEDEMANN

The RA-41P Turret Punch Press *Pays for itself in 2 YEARS or LESS*



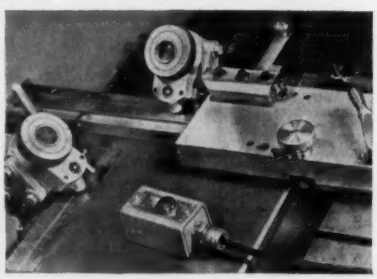
Save 90% on PIERCING

- Unmatched for high speed, low cost duplication of intricate hole patterns in flat sheet metal—low to medium production quantities.
- 18 or 20 punches and dies in turrets ready for use.
- Hole locations are made to a color-coded template—50 or more holes per minute.



Save 90% on TEMPLATE MAKING

- Press can be supplied with optical dimensioning instruments for template making.
- These templates are used with the RA-41P as well as for other applications. Drill jigs, prototypes, etc. are also produced to a tolerance of ±.002″ in 10% of the time usually required.



Wiedemann ships each press tooled—ready to produce your parts as soon as the machine is leveled and connected to your power line.

Wiedemann engineers will be pleased to study your drawings and show how these savings can be yours.

Write for a copy of Bulletin 241

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

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Ford

THE "OVERHEAD DOOR" TRADE MARK

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STUDEBAKER

NICE

MASSEY M-H HARRIS

ZENITH

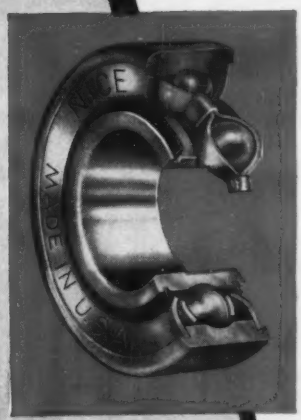
KINNEAR ROLLING DOORS

CM HOISTS AND CHAIN

BALL BEARINGS

In Thousands of Uses... by Thousands of Users!

the P&H Line



Nice Bearings have proven their economic and performance value in the accepted products of many hundreds of well-known manufacturers.

Have YOU investigated the design and cost saving opportunities offered by the NICE LINE?

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MM MINNEAPOLIS-MOLINE MODERN MACHINERY

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FRUEHAUF TRAILERS

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Crawford Doors

NICE BALL BEARING COMPANY

NICETOWN · PHILADELPHIA · PENNSYLVANIA

13 Key Moore Tools help put the PRECISION in Harig Dies

KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical toolroom operations.

A trip through Harig's modern Chicago plant reveals:

3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

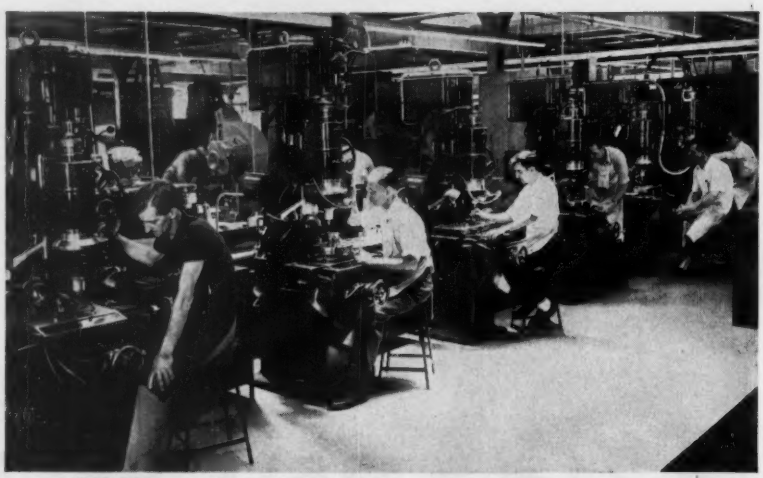
3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

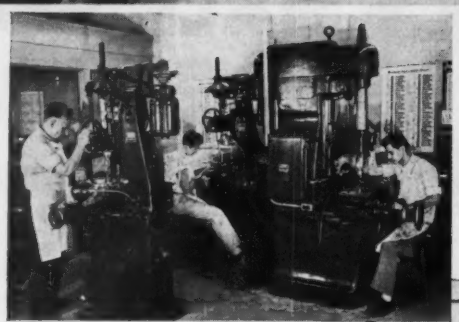
The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to *your* toolroom. Write today for our detailed literature.

Moore Special Tool Company, Inc.
734 Union Avenue, Bridgeport 7, Connecticut

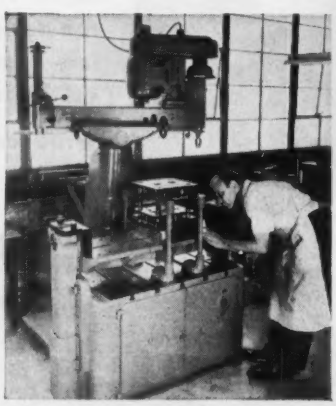


A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.



A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

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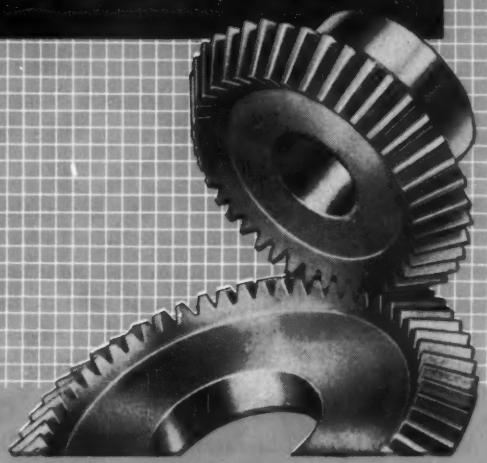
THE ULTIMATE IN

BEVEL GEAR ACCURACY



- low-cost tooling
- simplicity of set-up

NO. 120 MIKRON

fine pitch

BEVEL GEAR HOBBING MACHINE

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

This leadscrew "leads" a double life!

No need to replace the leadscrew of your Lodge & Shipley Oil Country Lathe if it eventually becomes worn on the head end. Simply reverse the leadscrew, end for end, for renewed accuracy.

On an Oil Country Lathe, most of the work is done close to the spindle nose. As a result, the greatest wear occurs at the headstock end. Lodge & Shipley's unique reversible feature provides real savings by doubling leadscrew life.

It's one of the many reasons why the versatile Lodge & Shipley Oil Country or Hollow Spindle Lathe is in demand far beyond the oil fields. Equally efficient for very long pieces chucked through the large hole in the spindle, or for normal between-centers work, it saves capital investment and floor space. And, the two-speed tailstock makes drilling large holes easier.

Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Two views of the Lodge & Shipley Hollow Spindle leadscrew show reversibility feature.

LODGE & SHIPLEY HOLLOW SPINDLE LATHES

Lodge & Shipley *....your* **LODGE-***ical choice!*

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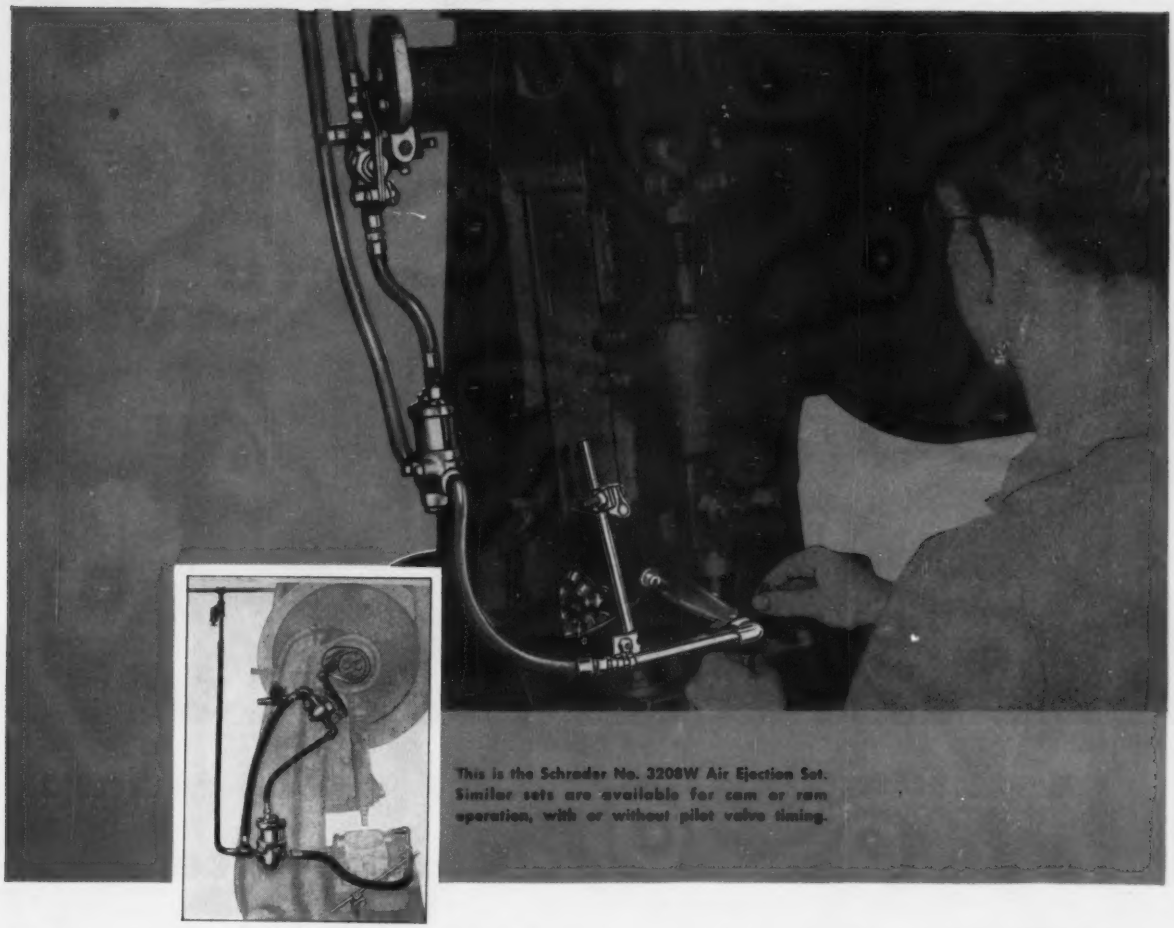

This is the Schrader No. 3208W Air Ejection Set. Similar sets are available for cam or ram operation, with or without pilot valve timing.

How to double production... reduce air consumption

With Schrader Air Ejection Sets on your presses, after each press cycle, there's a quick blast of air automatically timed to do the job just right—ready to take the next blank to be inserted in half the time it takes manually! No more tedious, dangerous hand removal! No more wasteful steady air blasts!

Schrader Air Ejection Sets come in many types to suit any need. You can buy them for cam operation off the crankshaft, or for roller tripper actuation from the ram. If the parts you are fabricating are too heavy to be blown from the dies by an air blast, the Schrader Cylinder Knockout Set is available, which utilizes the knockout force available from a push-type Schrader Cylinder.

But regardless of the type of ejection you need, you'll find a Schrader set exactly suited to your requirements. Schrader Air Ejection Sets come complete with all necessary fittings, valves, hose and air line accessories—all ready to be bolted to your press. Write for specification data. Fill out the convenient coupon below and mail today.

Schrader

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LEADERS IN AIR CONTROL SINCE 1844

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges

The complete Schrader line of pneumatic accessories includes everything you need

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
454 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. B-4

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Rush Stamping Company gives stamp of approval to Cities Service

Some of Rush's Stampings awaiting shipment. The rapidly growing, 4½ year old firm makes parts for auto hot water heaters, brake levers, vacuum cleaners, and air conditioning units.

Chief Engineer Fred W. Selter switched to Cities Service drawing oil a year ago. He praises it for eliminating need for many compounds, preventing build-up on dies, and lowering costs.

Praises Cities Service drawing oil as timesaver, worksaver, moneysaver.

The four and a half year old Rush Stamping Company of Toledo, Ohio, has already grown into a sizeable operation. Producing stampings for air conditioning units, vacuum cleaners and automotive parts, the company utilizes 41 punch presses ranging from 35 to 400 tons in pressure.

Like many other stamping companies, Rush was using a variety of paste type compounds for its drawing operations and suffering the penalty of heavy costs and build-up on dies which such compounds inflict. Then, a year ago, they switched to Cities Service drawing oil.

Here are the results in the words of F. W. Selter, Chief Engineer: "Now one Cities Service Oil does our variety of jobs, completely eliminating previous number of products and compounds required. This oil prevents build-up on dies formerly created by our paste type compounds, and in some applications saves as much as 50% in costs over these compounds. In addition, Cities Service has eliminated supply problems by offering us local warehousing and engineering services."

Learn more about Cities Service drawing oils which have already received the stamp of approval from so many firms. Talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

For more information on products advertised, use Inquiry Card, page 237

Future Productivity demands

SIP's *Guaranteed* high precision—now!

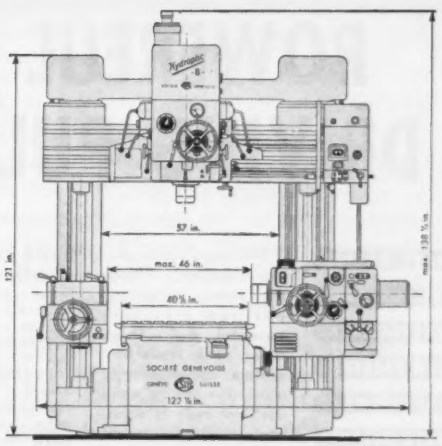
YOUR planning for the future is influenced by economists' predictions for tremendous industrial expansion during the next 15 years. By way of example, our 1970 population of 200-million is expected to support a market for 7.5-*million* new passenger cars.

To keep pace with growth, forward-looking Managements right now are formulating, if not actually developing, long-range tooling modernization programs. It is their one sure way to strengthen competitive positions…to take advantage of ever-increasing manufacturing efficiencies…to effect the necessary labor-and-dollar savings.

Basic to your present and future tooling programs are SIP Hydroptic Jig Borers. However exacting your precision standards, however intricate and voluminous your production, it is the SIP Hydroptic which will define and establish an essential *basic* Accuracy in your plant—and reliably maintain it during the busy years to come.

SIP offers you a *guaranteed* setting Accuracy: within .0002" on the large Hydroptic 8P's and 7P's, and within .00015" on the medium size Hydroptic 6. For complete details, see your nearby SIP Distributor, or write directly to

AMERICAN SIP CORPORATION
100 East 42nd Street, New York 17, New York.



HYDROPTIC-8P JIG BORING AND MILLING MACHINE

SIP *for precision*

The divisions on the Hydroptic's Standard Scales are magnified 22.5x on to Viewing Screens. They give you *"a tenth at a glance,"* with nothing to wear out—ever.

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

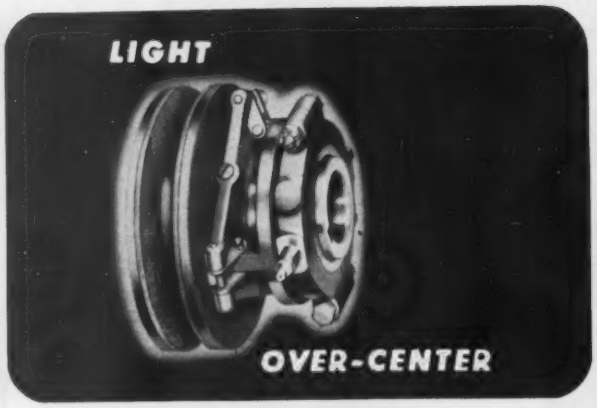
ABRASIVES
See Discs, Abrasive

ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Dv., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Main St Ansonia, Conn.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

ROCKFORD



POWERFUL DRIVING PULL

COMPACT DESIGN
POWERFUL PULL*
SMOOTH ENGAGEMENT
UNIFORM PRESSURE
FINE ADJUSTMENT
ACCURATE BALANCE
LONG SERVICE LIFE

* The toggle action goes "over center", locking the clutch in driving position; providing powerful pull. Operating pins, links and rollers are hardened steel. The strong, symmetrical body is accurately machined, as are the release sleeve and bearing.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

BW

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 410 Catherine Street, Rockford, Illinois, U.S.A. ▲

CLUTCHES

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc
New Jersey Zinc Co., 160 Front St., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

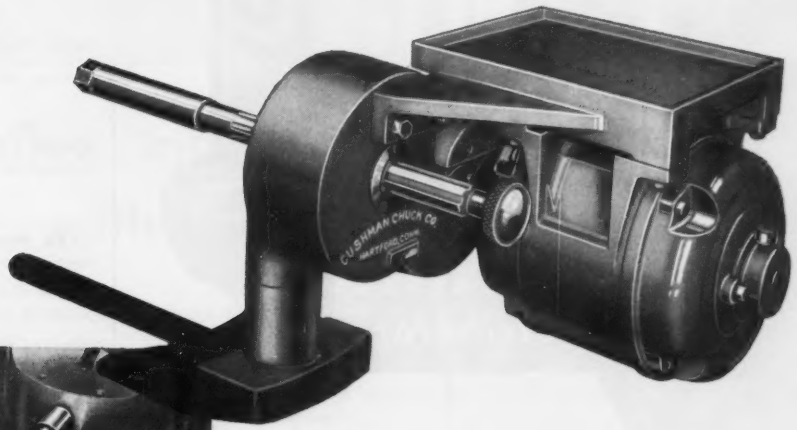
ARBORS AND MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chcago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

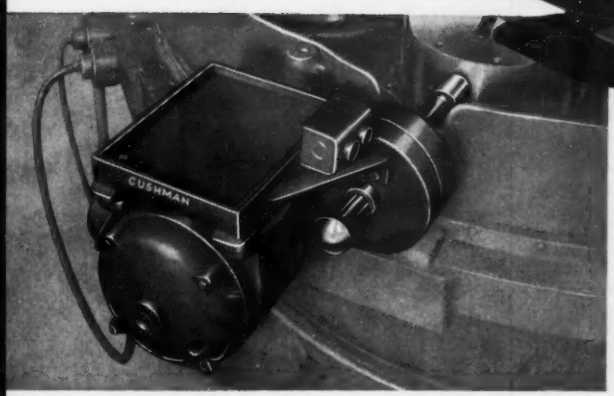
(*Continued on page 292*)

CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

the key to machining efficiency





The Cushman Power Wrench, push-button controlled, eliminates time-consuming, fatiguing, hand wrenching of chucks on single and multi-spindle machines, especially where repetitive machining operations are being performed.

Cushman Power Wrenches are available with either an 8 or 24 ft. lb. motor, delivering a maximum of 180 or 600 ft. lbs. torque respectively. With the addition of the Cushman Variable Torque Control, developed especially for use with the Power Wrench, the operator may, by setting the selector switch, choose any one of 9 approximately equal stages of torque and inertia. Wrenches equipped with 8 ft. lb. or 24 ft. lb. stall-type motors will deliver from 45 to 180 ft. lbs. or 150 to 600 ft. lbs. respectively.

If greater or less driving force is required, the Cushman Engineering Department can design wrenches to suit your needs. Write Cushman for Bulletin No. 211D fully describing and illustrating the Cushman Power Wrench — or, should you have a special work-holding problem, consult Cushman.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

a world standard for precision

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1852

CUSHMAN CHUCKS . . .
a Product of American Quality, Labor and Materials

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

1C555

...for ready made bearings that meet many requirements

Every size of the 854 different Bunting stock bearings is selected with scrupulous, painstaking care. Each individual bearing not only fits many common applications in all kinds of industrial machinery but can be altered quickly and economically for many other and unusual requirements.

HE HAS PLENTY

Your Bunting Distributor carries in stock for your money saving convenience completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes, meeting all your usual production and maintenance needs. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, Bronze or Bearings, Bronze. Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. He has been especially selected for his responsibility and his understanding of bearing requirements. Ask him for the Bunting Catalog or write.

Bunting®

BRONZE BEARINGS · BUSHINGS · PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE COMPANY, TOLEDO 1, OHIO
BRANCHES IN PRINCIPAL CITIES

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T. & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

BALL BEARING TESTERS

Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

BALLS

Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Rooler Bearing Co., Canton, Ohio
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Ball

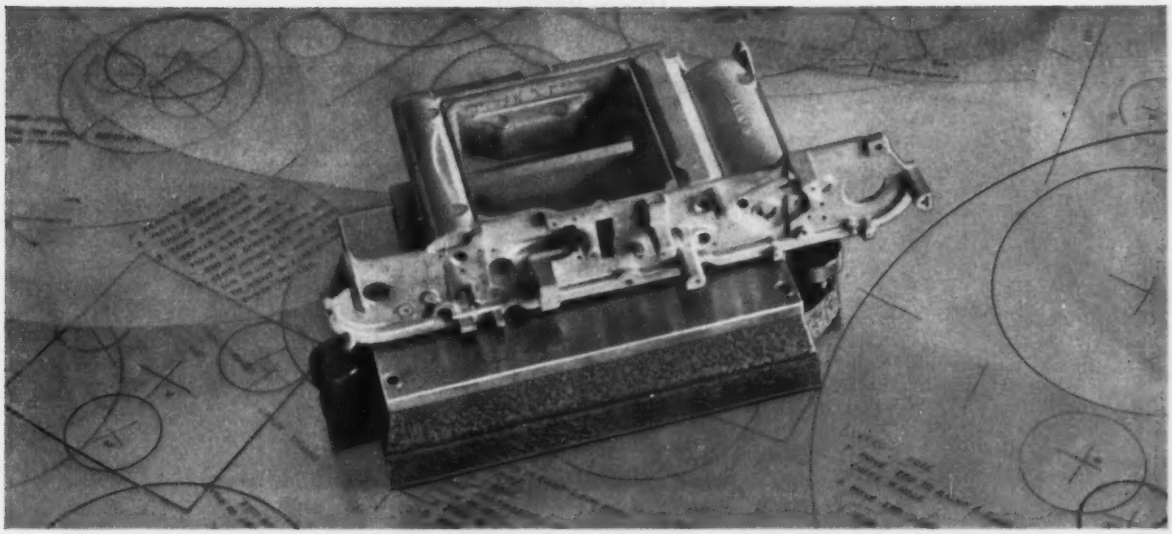
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.

BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer & Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.

(*Continued on page* 294)

For more information on products advertised, use Inquiry Card, page 257



How Graflex, Inc., *cut production costs* with a Kodak Contour Projector

If you've been thinking of optical gaging only in terms of toolroom measurement or final inspection, see what it does when linked to production operations.

GRAFLEX, INC., was producing a complex precision part in which spacing of 40 holes and 12 bosses had to be held to ±.001".

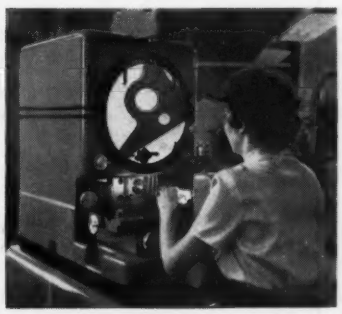
To solve this tolerance problem, Graflex used a Kodak Contour Projector because: (1) mechanical gages would have been too costly for the required run; (2) optical gaging would be faster; (3) the Kodak Contour Projector gave a quantitative as well as qualitative check.

Here's how this helped cut production costs and speed the work:

Optical gaging made it possible to check parts as they were run, to discover errors before more time and labor were spent on the part; no expensive machining was wasted on parts later found to be out of tolerance. It assisted in assembly operations, too, since the exact condition of the parts was known. And the part could be quickly rechecked at any point during production when a question of tolerance or condition arose.

A Kodak Contour Projector was also used in final inspection—doing in 20 minutes a job estimated at 4¼ hours by surface plate inspection. When the run was completed, the comparator was available for another job.

Perhaps you have production problems that can be solved by fast, accurate, *complete* measurement and inspection. There's a field representative in your area who can evaluate your needs for you. To get in touch with him, or for a copy of the illustrated booklet "Kodak Contour Projectors," mail the coupon below.



Graflex, Inc., used a Kodak Contour Projector, Model 2A, for this operation. The Model 2A is completely equipped for precision micrometry. In addition, it has a magnification selector, built-in surface illuminator, and permits the staging of parts in any plane. As with all Kodak Contour Projectors, it requires no hood.

the KODAK CONTOUR PROJECTOR

EASTMAN KODAK COMPANY 91
Special Products Sales Division, Rochester 4, N. Y.

☐ Please send me a copy of your booklet "The Kodak Contour Projectors."
☐ Put me in touch with your representative.

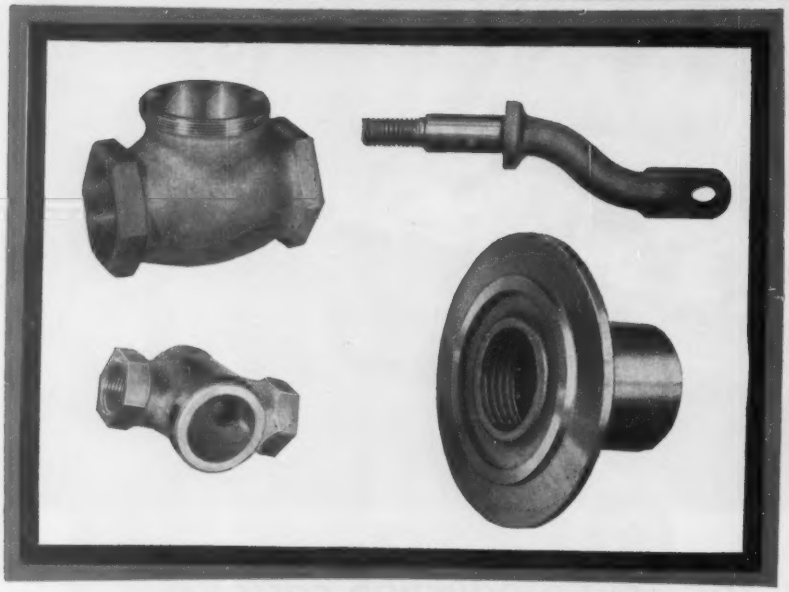
NAME_____ TITLE_____

COMPANY_____

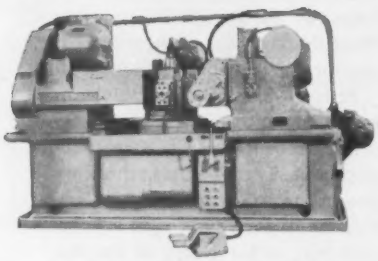
STREET_____

CITY_____ STATE_____
(Zone)

Kodak
TRADE-MARK



PLAN PRODUCTION of
PARTS LIKE THESE and MANY OTHERS . . .
for speed, convenience and economy
on GOSS & DeLEEUW AUTOMATIC CHUCKERS

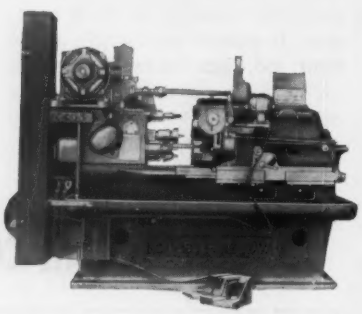


The "ONE-TWO-THREE" 7-Spindle TOOL ROTATING CHUCKING MACHINE

can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.

4-SPINDLE TOOL ROTATING CHUCKING MACHINES,

available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended parts.



Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle
Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Roolway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self-Lubricating (Oilless)
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BELT SHIFTERS
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

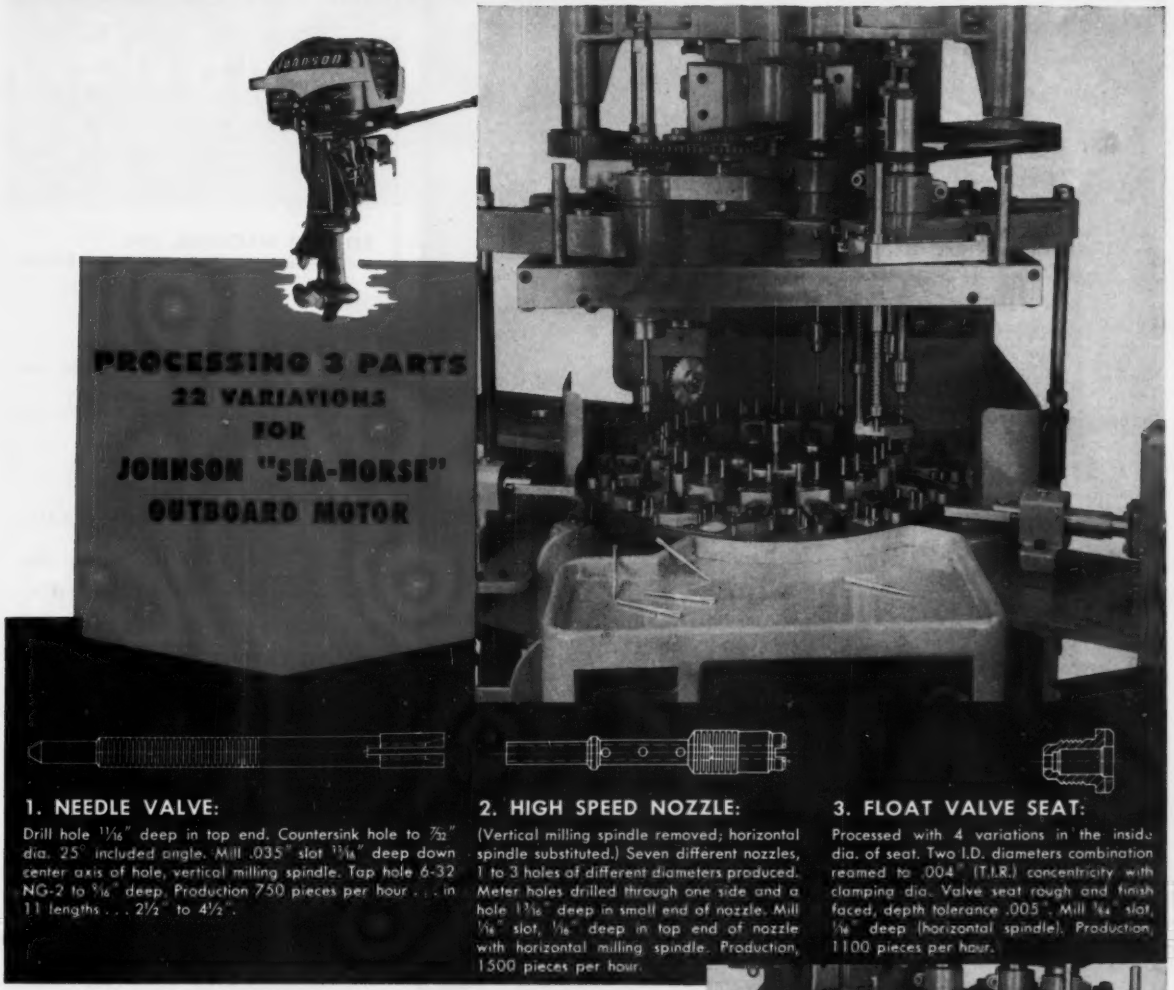
BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 656 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

(*Continued on page* 296)

For more information on products advertised, use Inquiry Card, page 257

Bodine CASE HISTORY NO. 39



1. NEEDLE VALVE:

Drill hole 1 1/16" deep in top end. Countersink hole to 7/32" dia. 25° included angle. Mill .035" slot 13/16" deep down center axis of hole, vertical milling spindle. Tap hole 6-32 NG-2 to 5/16" deep. Production 750 pieces per hour . . . in 11 lengths . . . 2½" to 4½".

2. HIGH SPEED NOZZLE:

(Vertical milling spindle removed; horizontal spindle substituted.) Seven different nozzles, 1 to 3 holes of different diameters produced. Meter holes drilled through one side and a hole 1 3/16" deep in small end of nozzle. Mill 1/16" slot, 1/16" deep in top end of nozzle with horizontal milling spindle. Production, 1500 pieces per hour.

3. FLOAT VALVE SEAT:

Processed with 4 variations in the inside dia. of seat. Two I.D. diameters combination reamed to .004" (T.I.R.) concentricity with clamping dia. Valve seat rough and finish faced, depth tolerance .005". Mill 1/64" slot, 1/16" deep (horizontal spindle). Production, 1100 pieces per hour.

The three jobs detailed above are produced on the Bodine standard Model No. 41-20 . . . by means of a changeover of two horizontal indexing dials and sets of spacers for the variety of lengths of the needle valves.

All parts are hand fed, automatically positioned and clamped. The needle valves are automatically unclamped and unloaded by hand to protect the needle points. Other products are automatically ejected.

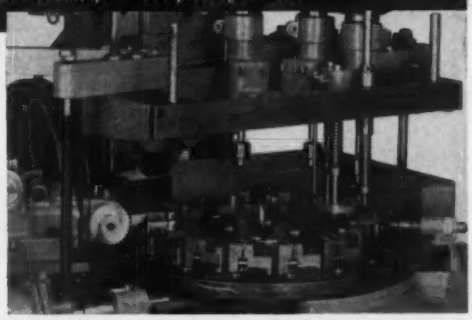
The installation of the vertical (photo above) and horizontal (photo at right) milling spindles with the other tools saved an extra handling on all three jobs.

All operations are held to close tolerances. Bodine offers 4 standard-size models which will perform Drilling, Tapping, Milling and Screw Inserting. Operations may be combined as required . . . or machines may be tooled for assembly only, with hopper feed and transfer mechanism for completely automatic production.

Bodine automatics will give you tomorrow's production today. Send us your tough problems . . . we may solve them to your competitive advantage.

Write Dept. M-4 for the Bodine Case History Brochure.

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools"



THE Bodine CORPORATION

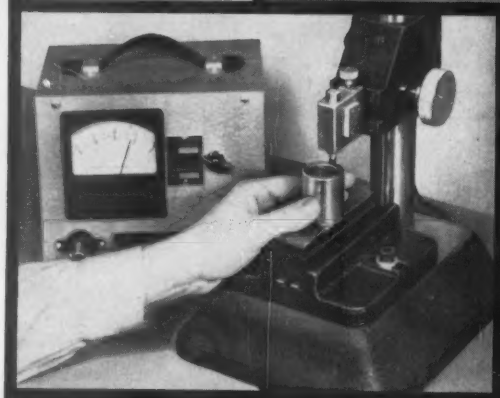
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

For more information on products advertised, use Inquiry Card, page 257

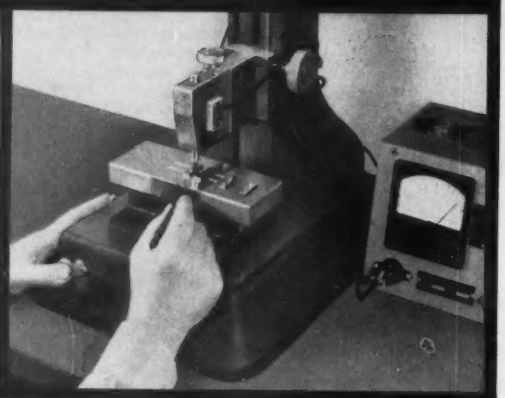
For CONSISTENT REPEAT READINGS of Size — Runout — Taper — Concentricity . .

INDI-AC Electronic Indicator, for all-around surface plate work and for checking setups and runout on the machine. Reads .0005"/.000050" or .0001"/.000010" per scale division.

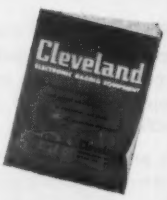


PAR-AC Electronic Production Gage, for high-precision repetitive gaging in the shop or inspection department. Reads .0005"/.000050" or .0001"/.000010" per scale division.

MICRO-AC Electronic Microcomparator, for gage room use and ultra-precision production gaging. Reads .000010"/.000001" per scale division — or .000001"/.0000005"



These gages are *stable* and *friction-free* — give *consistent repeat readings*. ● They are used with a recorder to provide a *pen-drawn record* of runout, size deviations, etc. ● Gage heads and amplifiers are used with *special fixtures* — and for *automation* applications. ● BULLETIN 542 describes the equipment — tells how it works — shows numerous applications. May we send you a copy? Write —



CLEVELAND INSTRUMENT COMPANY
735-2 CARNEGIE AVE. ● CLEVELAND 15, OHIO

Cleveland | ELECTRONIC GAGING EQUIPMENT

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machne & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BENDING MACHINES, Pipe
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

BLAST CLEANING EQUIPMENT
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

BLUING LAYOUT
Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

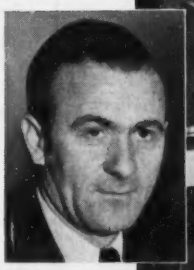
BOOKS, Technical
Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

(*Continued on page 298*)

For more information on products advertised, use Inquiry Card, page 257

Plant engineer talks Turchan . . .

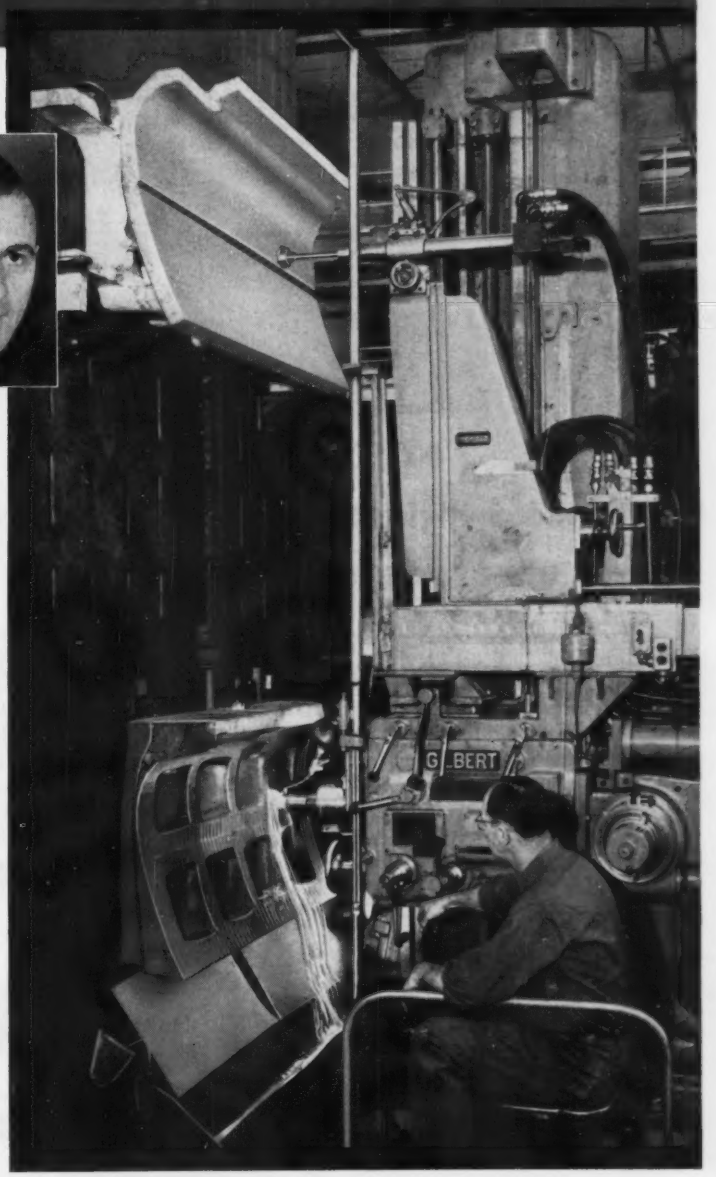


Gentlemen!

"Our recently installed Turchan Hydraulic Follower has given us a low investment duplicator, capable of doing close tolerance contouring. It has proven to be trouble free and simple to operate. The Turchan Follower lends itself to quick and easy conversion from a duplicator to a mill.

Today we are doing a wide variety of contour milling faster, less expensively and equal to any other type of duplicating available."

Very truly yours,
MONARCH PRODUCTS CO.
T. Gelemey
T. Gelemey
Plant Engineer



No human being can duplicate the exceptionally fast and accurate reproduction of a Turchan Follower Attachment.

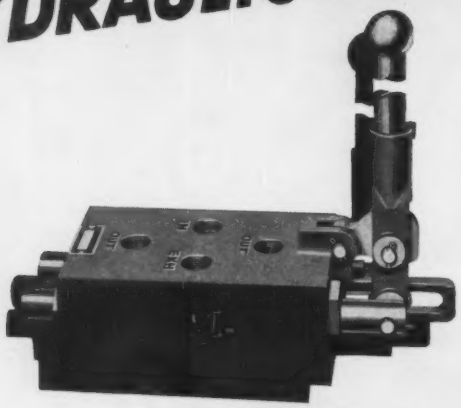
Small machines or large can be equipped to handle work and the limitations . . . of production or precision . . . depend entirely upon the capacity of the machine involved . . . Finish can be greatly improved and shop capacity can be greatly increased.

• *Write today for a* **TURCHAN** *folder . . .*

Turchan FOLLOWER MACHINE CO
8259 LIVERNOIS AVE. DETROIT 4, MICH.

Quick-As-Wink®

HYDRAULIC VALVES

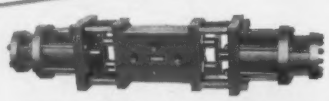


Hand Lever and Pilot Cylinder Types—pressures to 5000 psi.

Have won industry wide recognition for unsurpassed dependability

• Positive and fast acting, Quick-As-Wink Control Valves are designed and built to meet the most exacting requirements. Bodies of hydraulic valves are either forged or milled from solid bars. The hollow, radially ported, stainless steel plungers are chrome plated and polished to minimize wear. All parts are readily accessible and maintenance—that consists mostly of the very occasional replacement of the packing — can be done easily **in the field** without even disconnecting the piping. This avoids the necessity of returning valves to the factory for servicing or maintaining large standby inventories. Let us recommend the sizes and types that will meet your requirements best. Write for Bulletin 531. It gives full details.

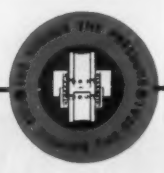
Ask us also about . . .



DOUBLE PILOT CYLINDER HYDRAULIC VALVES operated with air or hydraulic pilot cylinders—3 position; neutral, compound-on or compound-exhaust.

DOUBLE SOLENOID "O-TYPE" VALVES for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

Quick-As-Wink AIR AND HYDRAULIC Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1945 East Pershing St., Salem, Ohio

Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

(*Continued on page* 300)

For more information on products advertised, use Inquiry Card, page 257

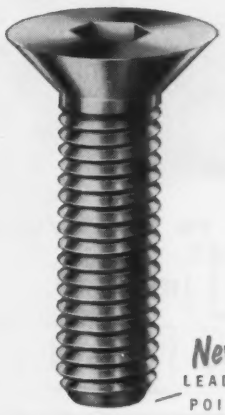
The BUY word for Socket Cap Screws is ALLEN

The *easy* way to make sure of greater strength, better fit and uniform quality in socket cap screws is to order "not just Allen-type but genuine ALLEN."

PRESSUR-FORMING

The latest improvement in the cold forging method originated by Allen. The tough Allenoy steel fibers are preserved continuous and uncut.

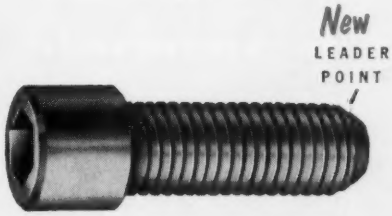
GRIP HEAD CAP SCREWS
The world's easiest starting, straightest driving, firmest holding cap screws.



FLAT HEAD CAP SCREWS
For firm fastening with flush surfaces. Especially adapted to fastening thin plates and sheets.

BUTTON HEAD CAP SCREWS
Produces smooth streamlined appearance where countersinking is impractical.

STAINLESS STEEL



Bright, non-corroding, high tensile strength type 18-8. 151 popular sizes (NC & NF) *available from stock.*

THE ALLENUT

Provides a ready-made threaded hole for use with cap screws in soft materials and for repair applications. Endless uses for compact design, space saving.

Sold Only Through Leading Industrial Distributors

Take advantage of their large stocks and fastener experience. Write direct for General Catalog G55.

ALLEN
MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

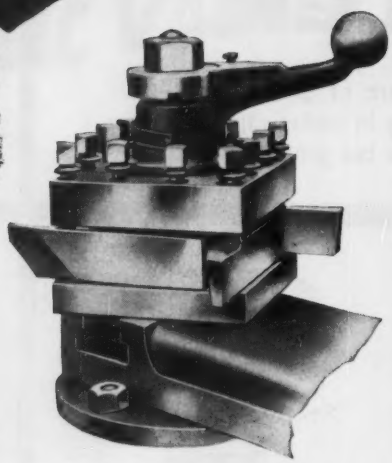
ALLEN HEAD

For more information on products advertised, use Inquiry Card, page 257

McCROSKY

COST CUTTING TOOLS

5 STYLES
9 SIZES



Turret
TOOL POSTS

permit successive tools to be swung into position **quickly** indexed **accurately** and locked **rigidly**

Endorsed by All Well Known Lathe Manufacturers

Multiple tool jobs become continuous when you use McCrosky Turret Tool Posts. They permit engine lathes to handle — efficiently and economically — a wide variety of work that otherwise would require a turret lathe or specialized machine. Ruggedly built. 12 indexing positions. Mount in the T-slot of the compound rest or bolt circle of the main slide. Unsurpassed for performance and satisfaction. Write today for Bulletin No. 18-T. It gives full details.

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION** MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

Jack-Lock® **MILLING CUTTERS** Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Cutters. Sizes to 24" in dia.

Universal **MILLING CUTTERS** Bodies can rotate in either direction. Simply using blades of proper hand, angle and cutting material, meets any requirement.

Block Type **BORING BARS** Bore more pieces in shorter time, with greater accuracy. Stock sizes with straight or tapered shanks, with or without pilots, for holes up to 15" in dia.

Super®-Adjustable **REAMERS** Chucking and shell designs. Proven construction locks blades rigidly, producing smooth, concentric holes.

Special **PRODUCTION TOOLS** Combine 2 or more related operations into a single tool, producing better products, quicker, and cheaper.

ask us about...

Wizard® **QUICK CHANGE CHUCKS** Tools are held centered and rigid. Operator can change tools without stopping or slowing down the spindle, increasing production and cutting costs.

Turret **TOOL POSTS** Successive tools are swung into cutting position quickly, indexed accurately and locked rigidly, giving engine lathes the versatility of turret lathes. 5 styles, 9 sizes.

McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
Taft-Peirce Mfg Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.

(*Continued on page 302*)

Vanadium-Alloys Steel Company

matchless performance

in Die Steels for Cold Work

because of

better toughness

better grain size control

better control of segregation

and

manufacture by specialists in first quality tool steels

exclusively!

Non-Shrinkable Colonial No. 6

The non-deforming, oil-hardening steel that combines ease of machining with low hardening temperature. Fine performance on blanking dies, punches, gauges, bushings, etc.

Air Hard

5% chromium, air hardening with minimum distortion. Provides toughness and better wear resistance for thread rolling dies, forming and blanking dies, knurls, punches, gauges.

Ohio Die

High carbon, high chromium alloy, air hardening. Affords exceptional resistance to wear, with long life on trimming die, lamination die, shear blade, coining die, roll, mandrel and other difficult assignments.

Crocar

Air or oil hardening. A high carbon, high chromium steel, highly wear resistant; properly selected for lamination dies, wear plates, slitting cutters, forming dies.

Red Star Tungsten

Oil hardening. Unusual edge strength and wear resistance, with high hardness. Specify for taps, punches, spinning tools, slitters, blanking dies.

VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

In Canada:

Vanadium-Alloys Steel Canada Limited, London, Ontario

"Sealed-in Lubrication"

Pat. Pend.

Cut-a-way shows oil reservoir in lubrication pistons.

Wick, inserted in groove between U-cups, supplies a constant film of oil to the full inside cylinder wall. Radial holes, drilled through from the groove to the reservoir, supply oil to the wick by capillary action. This assures low break-away action even if cylinder has been long idle.

Sealed-in oil is ample for thousands of cycles without attention.

It's another LEHIGH quality exclusive. See catalog for many additional features.

Lehigh HEAVY DUTY AIR MOTORS

For converting any foot or hand operation on tools, processing or handling equipment to semi or completely automatic operation.

Combines a LEHIGH Double-Acting, Self-Lubricating Cylinder with a LEHIGH 4-way Air Powered Valve and a wide choice of electric and/or air controls and mountings.

For air pressures up to 200 P.S.I. Standard bores: 1½" — 2" — 3". Any desired stroke. Larger bores on special order.

Built to rigid quality standards, proved by long years of use, used as "standard equipment" on many famous machines. Backed by nation-wide field engineering service.

Write for catalogs and name of nearest Lehigh representative

Lehigh INC.

ENGINEERS AND MANUFACTURERS
1507 Lehigh Drive
EASTON, PENNSYLVANIA

SELF-LUBRICATING AIR CYLINDERS
3 or 4-way AIR POWERED VALVES
Lehigh Minor AIR VALVES & CYLINDERS
COMBINATION VALVES
Lehigh INC.
ELECTRIC FOUNDRY PRODUCTS. PROFILE TRACING LATHE ATTACHMENTS. COMMERCIAL REFRIGERATION SYSTEMS. AUTOMATIC VENDING MACHINES.

Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Shearcut Tool Co., Reseda, Cal.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

BUFFERS

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

(*Continued on page* 304)

this double-ram vertical

LAPOINTE BROACHING MACHINE

with electro-mechanical drive

lends itself to carbide tooling because of its

higher speed ranges

here's BROACHING EFFICIENCY at its best!

Simultaneous broaching of rotor wheel slots and mating buckets (the latter requiring two progressive operations).

. . . that's balanced production!

125 broaching cycles per hour, at 80% efficiency, producing these parts faster than by any other known method.

. . . that's volume production!

No loss through rejections, because all parts are formed perfectly and to the close tolerances required of jet engine components.

. . . that's quality production!

One operator easily and safely handles this double ram machine, loading one ram while the other ram is broaching.

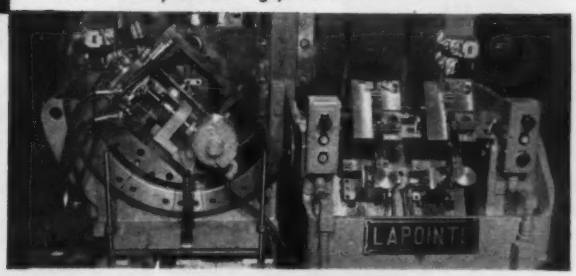
. . . that's efficient production!

FOR 53 YEARS LAPOINTE has been designing, engineering, and building broaching machines, tools and fixtures. That's all we do. It's no wonder that production men most naturally look to Lapointe to solve any broaching problem.

TWO UNIQUE FIXTURES

make this high production possible, the Lapointe IN-and-OUT self-indexing type for the rotor wheel slots (see ram on left), and the TIP-DOWN type for the mating buckets (see ram on right). The Tip-Down type fixture is exclusive with Lapointe.

If you would like a description of this LAPOINTE double-ram vertical broaching machine ask for Bulletin DRVE-1



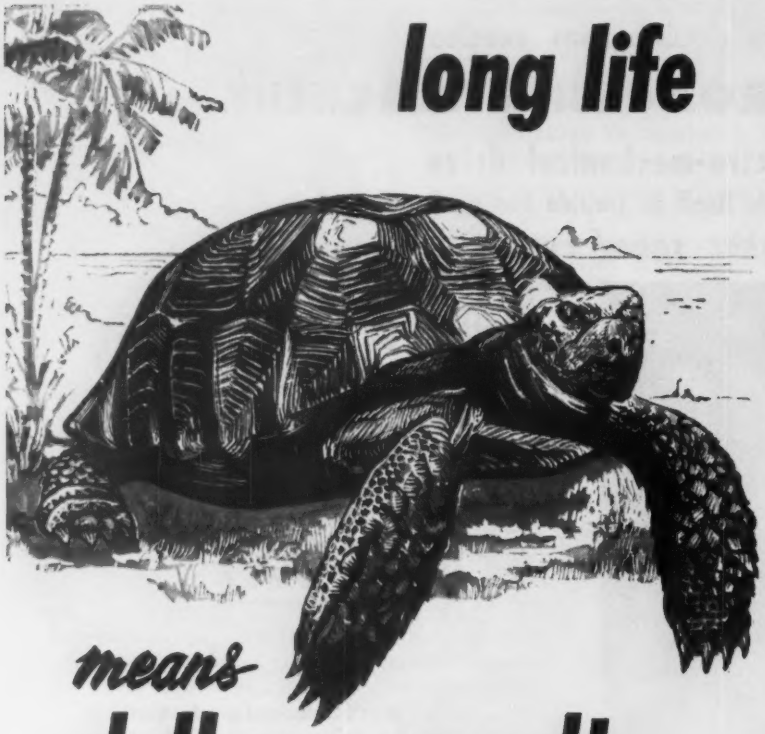
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

In England: Watford, Hertfordshire

HUDSON LAPOINTE MASS.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



long life

means

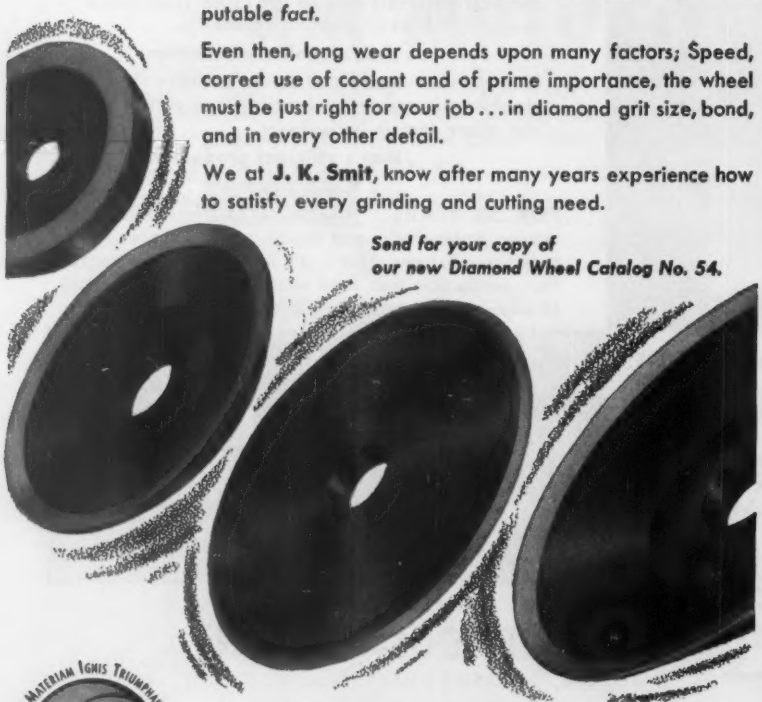
dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable *fact.*

Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

We at **J. K. Smit,** know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of our new Diamond Wheel Catalog No. 54.



J. K. SMIT & SONS, INC.

HOME OFFICE AND PLANT

MURRAY HILL NEW JERSEY

Additional plants in London, Paris, Amsterdam and Toronto, Canada

BUSHINGS, Hardened

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial) Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starret, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Allegheny Ludlum Steel Corp., Pittsburgh, Pa
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13 Mich.
Valenite Metals Corp., Box 205, Royal Oak Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating
(*Continued on page* 306)

Announcing...

Axelson announces the purchase of the Fray Line of Milling Machines and Milling Attachments which have been manufactured by the Fray Machine Tool Company, Burbank, California, for the past 14 years.

The milling machines and attachments are now being manufactured in the same plant that has built the world famous Axelson Heavy Duty Lathes, Precision Tool Room Lathes, and Special Machine Tools since 1915. The same engineering knowledge and skilled craftsmanship that has steadily improved Axelson Lathes will now be used to produce Axelson Milling Machines.

Axelson

Milling Machines

AXELSON MANUFACTURING COMPANY
Division of U.S. Industries, Inc.
6160 So. Boyle Avenue,
Los Angeles 58, Calif.

Authorized dealers in principal industrial centers.

Airflex®
PRECISION RIVETERS
TAKE THE TOUGH JOBS
High Frequency IMPACT with Spinning
Airflex® Riveters bring an entirely new technique to the field of fastening. Riveting now becomes feasible under conditions that previously made it impractical.
Wherever tolerances or riveting pressures are critical, or assemblies and materials are apt to distort or fracture, the Airflex® cold-flow principle has provided the solution. Selective tolerances as close as .002" between peened end of the rivet and the material are being maintained even on volume production. Materials impose no limitations—glass, ceramics and plastics can also be riveted economically. Capacity for steel rivets range from 3/32" to 1".
Airflex® Riveters can give you faster, better riveting on routine jobs—and the economy of riveting on the "impossible" jobs. Write now for complete information.
AIRFLEX® PRINCIPLE combines high frequency blows with a spinning action to cold-flow the rivet. Force of impact, rate of impact, duration of impact, and spinning speed are independently controlled. Operator training can be cut to a minimum.
LEMERT ENGINEERING CO., INC.
195 E. JEFFERSON ST., PLYMOUTH, IND.
Airflex®

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, Die

American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp, Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Haynes Stellite Dv., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Dakon Tool & Machine Co., Inc., 1836 Guilford Ave., New Hyde Park, N. Y.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 310)

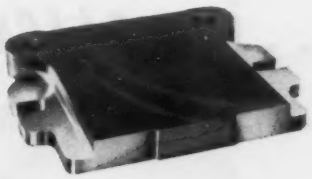
For more information on products advertised, use Inquiry Card, page 257

How many different 10x10 DANLY DIE SETS

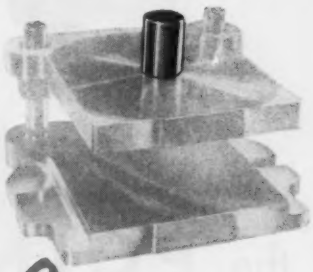
can you order from stock at your nearby DANLY Branch?

- ☐ 100 ?
- ☐ 1251 ?
- ☐ 4763 ?
- ☐ 31,104 ?

3 different punch holder thicknesses

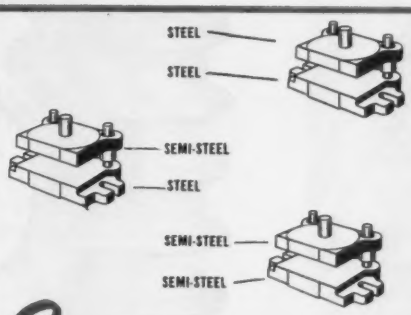


3 different die shoe thicknesses



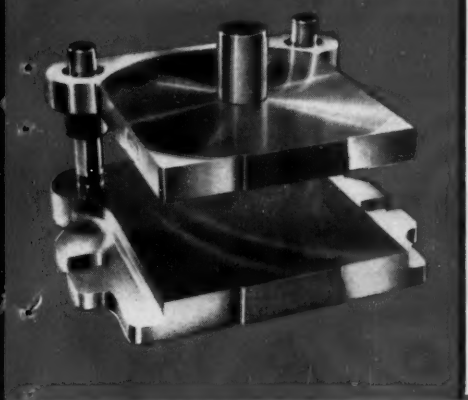
6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of **3** different styles to choose from



Multiply all of these combination possibilities together and you'll discover that there are *31,104* different standard Danly Die Sets in just this *one* size . . . and all are cataloged and *stocked* in the Danly Branch near you. Amazing? Yes, but it serves to illustrate an important point for *your* benefit. The almost unlimited variety of Standard Danly Die Sets *in stock at your Danly Branch* will meet your specific needs exactly . . . and fast. So remember, when you want the best in die sets in the shortest time, the place to call is your local Danly Branch.

DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Avenue, Chicago 50, Illinois

Choose the Danly Branch closest to you:

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
1549 Temple Avenue

GRAND RAPIDS
113 Michigan Street, N.W.

INDIANAPOLIS 4
5 West 10th Street

LONG ISLAND CITY 1
47-28 37th Street

LOS ANGELES 54
Ducommun Metals & Supply Co.,
4890 South Alameda

MILWAUKEE 2
111 E. Wisconsin Avenue

PHILADELPHIA 40
511 W. Courtland Street

ROCHESTER 6
33 Rutter Street

ST. LOUIS 8
3740 Washington Blvd.

SYRACUSE 4
2005 West Genesee Street

DANLY

DIE SETS . . .
STANDARD OR SPECIAL

DIEMAKERS' SUPPLIES

IS POINT BLUNT?

P-K Type A Sheet Metal Screws have sharp gimlet points. Start easy, drive straight, even when holes in two sheets are misaligned.

$0.15 ^ .015

. . . in assembly savings

the **POINT** makes the difference

A properly planned saving of 15 cents per unit can fade to 1½ cents — or nothing — on the assembly line . . . unless the screws you use have the good points that assure quick starting and straight driving.

Bad points are hard to detect in the package, but your cost sheets and customer complaints will soon show their effects — job slowdown, parts spoilage, hidden weakness.

That's why P-K quality standards have been set so high — to make sure you get P-K Self-tapping Screws that are not only *pointed for savings,* but headed, threaded, and heat-treated with one purpose, to keep your assembly lines trouble-free.

Start making *planned* assembly savings pay off . . . talk to a P-K Assembly Engineer. Parker-Kalon Division, General American Transportation Corporation, 202 Varick St., New York 14.

DOUBLE LEAD THREADS?

P-K Type Z Self-tapping Screws have well defined taper. Screw stands erect in hole and double lead thread means quick, easy starting; forms secure mating threads.

PARKER-KALON®

IN STOCK . . . see your nearby P-K Distributor . . .

HOW MANY FLUTES?

P-K Type F Screws have five thread cutting flutes; easier to start, less torque to drive, cut clean threads all the way in.

per unit

P-K STANDARDS
make sure you get
SCREWS POINTED FOR SAVINGS

P-K design and quality standards protect you against the bad points shown and many others that will slow down assembly and cause parts damage. They don't "get by" P-K Inspectors — that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality."

IS PILOT TOO SHORT?

Pilots of P-K Type U Drive Screws are proper size and length to permit screws to start straight, drive straight.

The First originated by P-K . . . and First today . . . the leading choice for fastening economy

SELF-TAPPING SCREWS

your local Supply and Service Specialist

For more information on products advertised, use Inquiry Card, page 257

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co., (Single and Multiple Spindle) 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

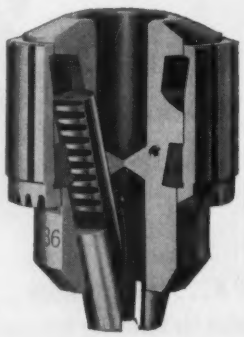
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

(*Continued on page* 312)

There is NO COMPARISON with a Jacobs

If you don't wear a gold service pin you probably won't remember when "Jacobs" *wasn't* the name for the finest drill chuck. Since Mr. A. I. Jacobs started it all, back in 1903, continual painstaking and specialized research has been lavished on Jacobs Chucks.

The Plain Bearing Jacobs Chuck pictured is undoubtedly the best known in the world . . . and with good reasons. It is a *precision* chuck capable of greater accuracy than any comparable chuck made today. It is a *strong* chuck, longer lasting on the job. It is a *hard-holding* chuck with a grip of tremendous power.

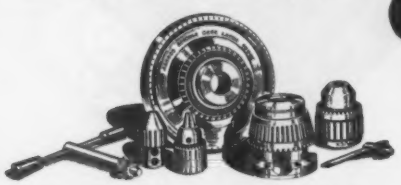


These good reasons add up to the unquestioned, uncompromising quality that makes your selection of drill chucks as easy as remembering the name *Jacobs*.

JACOBS AND YOUR LOCAL DISTRIBUTOR
are ready to deliver the chucks you need and the service you deserve.
first in chucks . . . first in service

Jacobs Manufacturing Co.
West Hartford 10, Conn.

Jacobs
CHUCKS
If it's a Jacobs–it holds



This rugged, powerful face grinder is used by the largest auto body manufacturer in the world . . .

Find out why!

For 18" Face Grinder Bulletin, write Abrasive Machine Tool Co., 12 Dunellen Road, East Providence 14, R. I.

CHUCKS, Gear
Gleason Works, 1000 University Ave., Rochester, N. Y.

CHUCKS, Lathes, etc.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic
Brown & Sharpe Mfg. Co., Prvoidence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

CLAMPS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal
Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

CLUTCHES
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS
See Gages, Comparator.

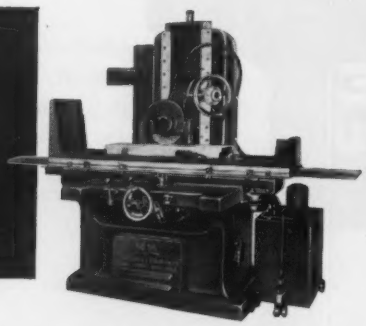
COMPARATORS, Optical
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).

(*Continued on page* 314)

When the need is for SPEED and PRECISION



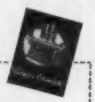
you need a

GRAND RAPIDS GRINDER

Here is extra value, extra accuracy, extra high-speed performance. Every Grand Rapids Hydraulic Feed Surface Grinder has a one-piece column and base for vibrationless rigidity and permanent alignment between cross travel ways and upright headways. Both longitudinal table travel and cross feed are hydraulically operated. On the larger machines, the wheel head is powered for rapid vertical travel. ***The model 55 has longitudinal table speed of 125 fpm.!***

Parts machined to micrometric tolerances, precision assembled for freedom of action, no play. That's why 6 out of 10 are sold to firms already using Grand Rapids Grinders.

Send for full facts today . . . we'll answer within 24 hours



GALLMEYER & LIVINGSTON

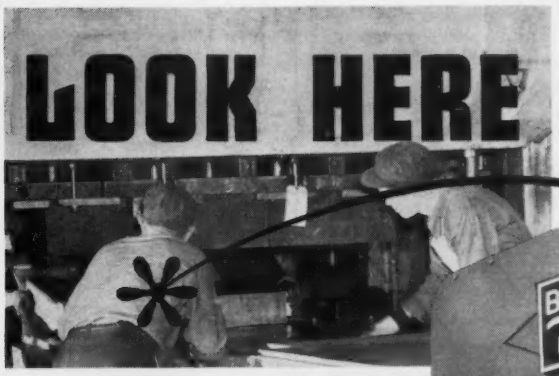
Please send me the following literature without obligation:

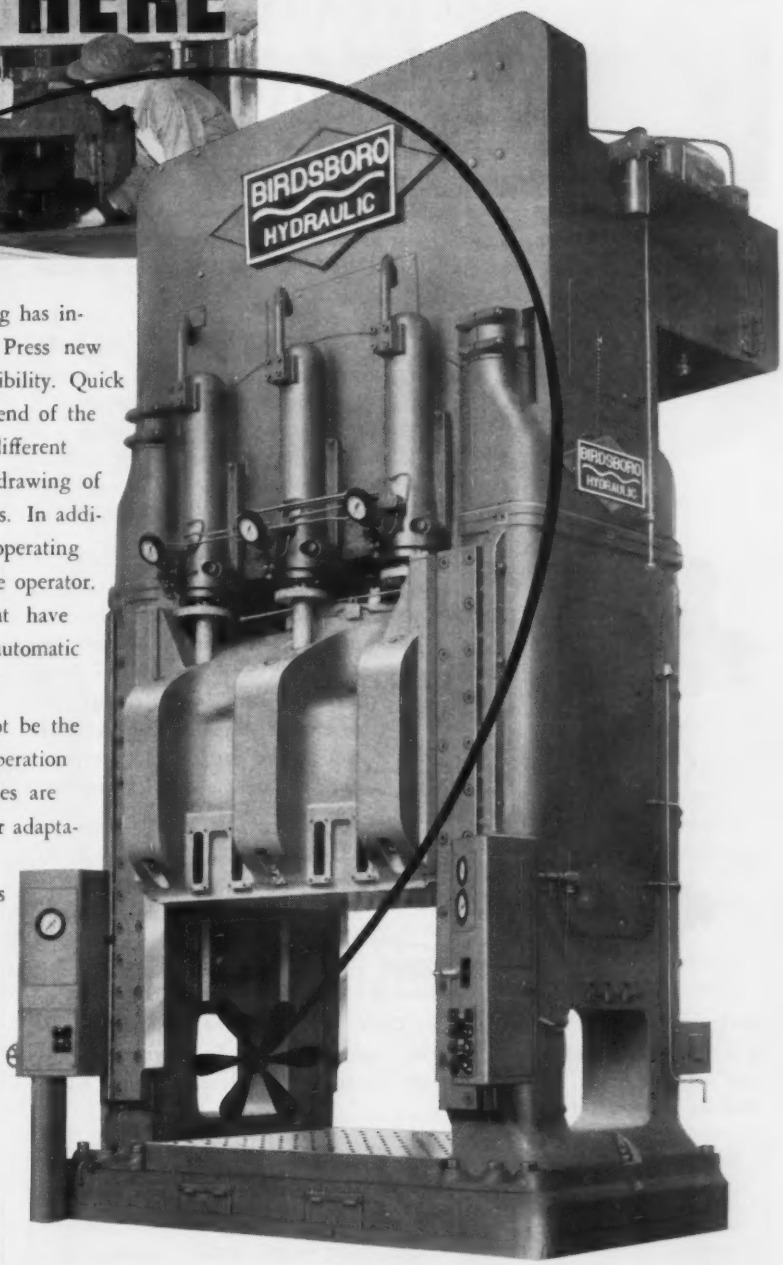
☐ Surface Grinder Catalog
☐ Universal Cutter and Tool Grinder Catalog

Attach to Letterhead and Mail to:
GALLMEYER & LIVINGSTON CO.
425 Straight Ave., Grand Rapids, Mich.

For more information on products advertised, use Inquiry Card, page 257

For Low Cost PRODUCTION





Birdsboro advanced engineering has incorporated in this Hydraulic Press new features that add greatly to flexibility. Quick adaptability at the "business" end of the press makes possible many different operations required for deep drawing of large or small sheet metal parts. In addition, the press provides rapid operating cycles under full control of the operator. Both operator and equipment have complete protection through automatic control features.

The press shown here may not be the "perfect" machine for your operation — but our engineering facilities are available to you at all times for adaptation of a present design, or engineering of a special press "tailored" to your requirements.

Designers and Builders of:

STEEL MILL MACHINERY
HYDRAULIC PRESSES
CRUSHING MACHINERY
SPECIAL MACHINERY
STEEL CASTINGS
Weldments "CAST-WELD" Design
ROLLS: Steel, Alloy Iron, Alloy Steel

HP 19-55

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

For more information on products advertised, use Inquiry Card, page 257

OLIVER ACE

Universal Tool and Cutter Grinders

When you equip your toolroom with an Oliver ACE to maintain "top" performing cutting tools the flow of production won't get too heavy and out of control . . . you won't risk costly "slow-downs" in your schedule or wasteful and expensive product rejects.

"TOPS" in precision, the ACE handles a wider variety of cutters than ordinary cutter grinders . . . handles the toughest grinding jobs with ease including, of course, Tungsten-Carbide work and high speed milling cutters and tools.

"TOPS" in economy, the ACE is easy to set up . . . needs only a small amount of floor space . . . requires less outlay of dollars. The ACE cuts time lags to the bone . . . the simplicity of design and operation makes economy of motion and fast grinding certain—only two simple fixtures required.

"TOPS" in ease of operation, the ACE requires no computation . . . direct reading for clearances reduces fatigue and eases operators' jobs in grinding the most difficult cutters.

Designed and built with integrity by Oliver of Adrian, the dependable ACE is a time proved example of superior engineering skill. Equip your toolroom now with the BEST . . . INVEST in an Oliver ACE Universal Tool and Cutter Grinder. . . **PROMPT DELIVERY.**

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular wood saws.

2 MODELS: Standard and Heavy Duty (illustrated)

Write Today for Complete Data

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.

1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
White & Bagley Co., Worcester, Mass.

COMPOUNDS, Resin and Moulding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

COOLANT SEPARATORS

See Separators, Oil or Coolant.

COUNTERBORES

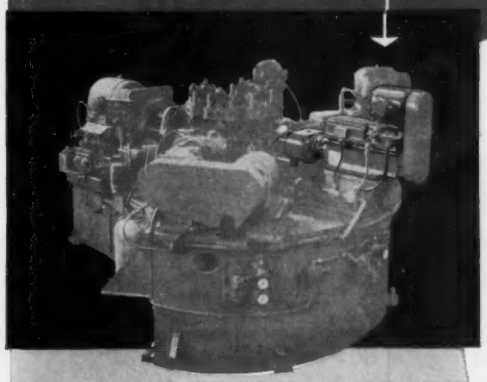
Allen Mfg Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(*Continued on page* 316)

New MORRIS AIR·OIL·MATIC DRILL UNITS

air power • hydraulic control or all-hydraulic models

Unit Type Six-station automatic indexing machine for drilling, tapping and facing a master brake cylinder. The Air-Oil-Matic unit shown drills two .026" diameter holes at 10,000 R.P.M. in cast iron.



perfected to give exceptional versatility for higher production at lowest cost

Here's the automatic drilling unit you've been looking for! The Morris AIR-OIL-MATIC Drill Unit is a powerful package of precise versatility developed and perfected by one of the nation's leading manufacturers of high production drilling machinery. Now, this compact unit (air or oil powered and hydraulically controlled) is available for your use in special purpose machines.

Designed for a wide range of drilling, reaming, chamfering, spot facing, hollow milling, centering and related operations, it can be mounted in vertical, angular or horizontal positions. The Morris AIR-OIL-MATIC Drill Unit has adjustable feed rate, feed stroke, total stroke. Controls and actuating devices can be set to provide almost any desired sequence of operations. (see condensed specifications)

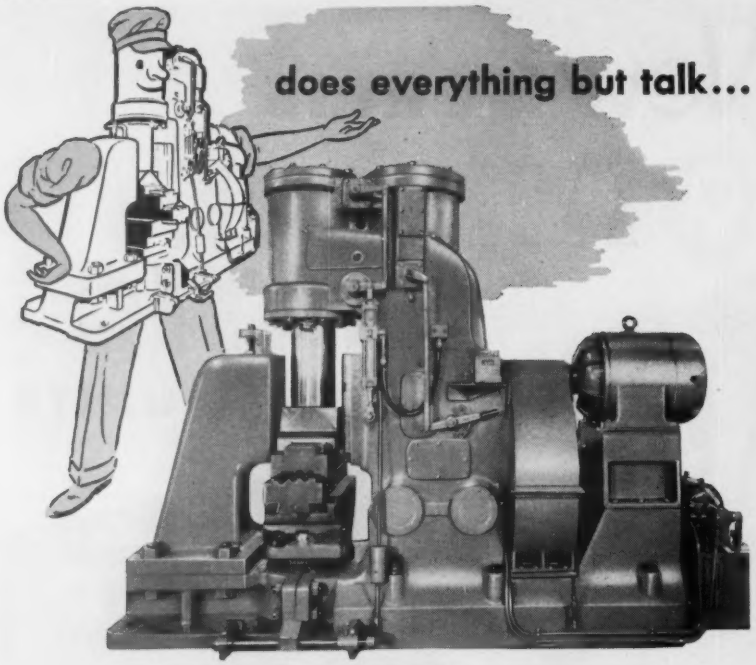
If you have mass production operations involving drilling or related operations . . . you'll want to know all about the Morris AIR-OIL-MATIC Drill Unit. New literature describing the unit, its advantages and applications and complete with specifications, is available on request.

CONDENSED SPECIFICATIONS

Length, width, height	33¼" x 11" x 23"
Maximum HP at 1800 rpm	2 HP
Spindle speeds	133-6900 (Standard) (Special speeds on request)
App. maximum thrust	650 lb.
Maximum drill size	⅜"
Maximum stroke	6"
Maximum feed stroke	4½"
Feed rate range	0 to 48"/min.
Quick approach rate	480"/min.
Quick return rate	300"/min.

Morris MACHINE TOOL COMPANY

946 HARRIET ST., CINCINNATI 3, OHIO



this new NAZEL ELECTRO-PNEUMATIC No. 6 "TYPE C"

FORGING HAMMER

just look at these features!

- Outboard Ram Guide, which allows both open and closed die forging and insures positive die mating . . . Anvil is mated to base for exact register.
- Die capacity is exceptionally large. Upper die shown is 14" by 40" by 7".
- Hydraulic Power Control . . . gives "feather touch" treadle or hand control changeable or removable for convenience.
- Light to heavy blow at touch of Control to suit job. Coining, planishing or forging.
- Direct Power Drive, with pinion running in oil for longer life.
- Modern Lubrication to *all* moving parts.
- Completely self-contained!
- This new NAZEL No. 6 "Type-C" is a floating ram hammer at its best . . . designed for continuous production, proper forging ratio . . . and, it is *economical!*

Further details are yours upon request.

LOBDELL UNITED DIVISION

1836 WILMINGTON 99, DELAWARE 1955

UNITED ENGINEERING AND FOUNDRY COMPANY

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13 Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

CUTTER GRINDERS

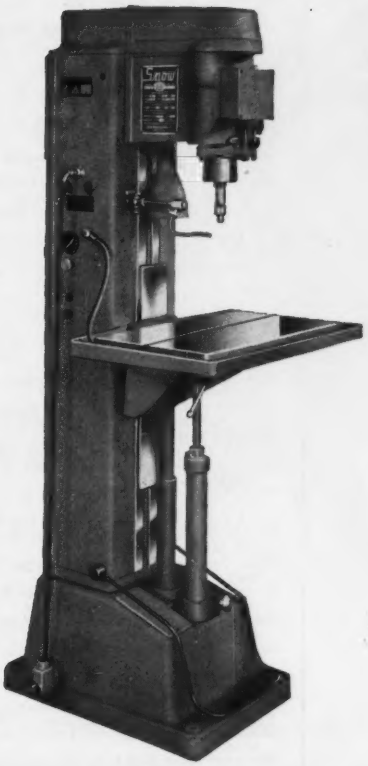
See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

(*Continued on page* 318)

For more information on products advertised, use Inquiry Card, page 257

SNOW MANUFACTURING COMPANY

455 EASTERN AVENUE • BELLWOOD, ILLINOIS



FULL UNIVERSAL
MACHINES
Electrically Operated—Air Controlled

. . . Drilling—TYPE "UD"

Capacities from #60 through 3/8" in two sizes

. . . Tapping—TYPE "UT"

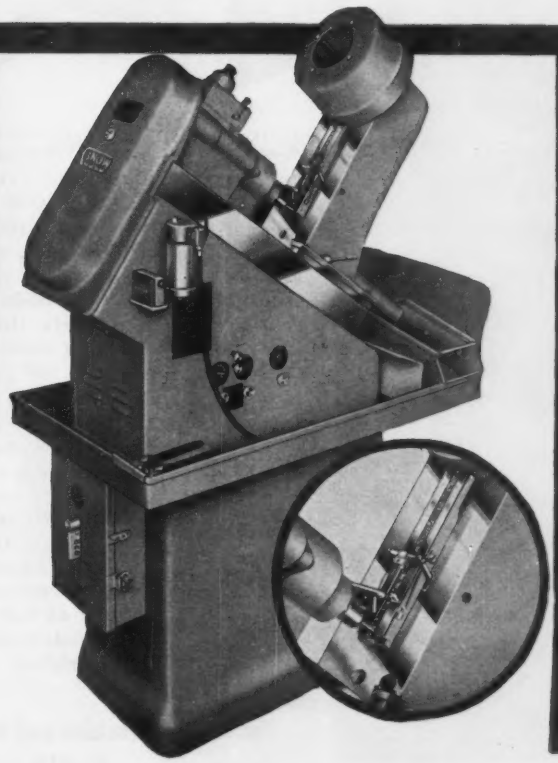
Capacities from #0 through 3/4" in four sizes

. . . Threading—TYPE "TR"

Capacities up to 1" in two sizes

AUTOMATIC and SEMI-AUTOMATIC
JIGS and FIXTURES
for Indexing and Clamping

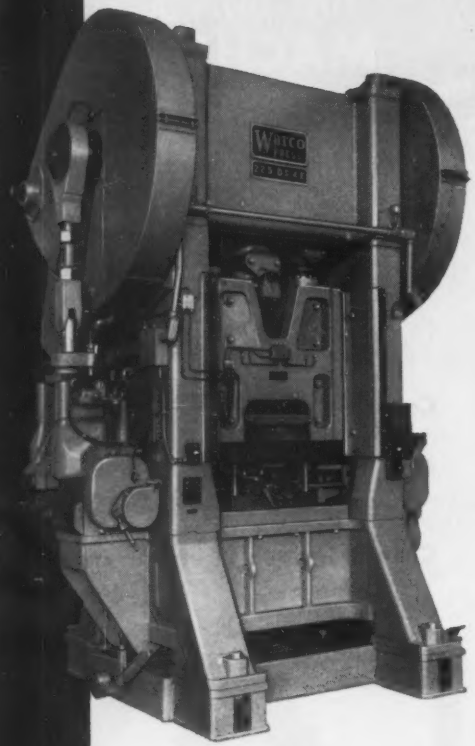
A complete line of basic Master Fixtures to permit adaptation of a wide range of parts at high production rate with low tooling cost.



FULL AUTOMATIC
Nut Tapping Machines

Completely automatic hopper feed nut tapping machines up to 1/8"—incorporating simplicity and low tooling cost. Standard taps are used. Precision class 3 and 4 fits and parallelism maintained at high speed and high production.

Warco the QUALITY LINE of presses



Working for the government this Warco Special Cartridge Case Press blanks and cups two 30mm cases with each stroke.

Special features include four post die set, roll feed, slide type scrap cutter with gag attachment for adjustable speed to control length of scrap, a built-in conveyor that removes finished parts through back of press, a stock locating device that prevents improper blanking.

It is a two slide press with both slides operating off one eccentric shaft with two throws. A safety feature stops press when end of strip will not give a complete blanked and cupped part. Every Warco Press is precision built and thoroughly inspected to meet customer's requirements. Every day more of the nation's metal fabricators recognize Warco's higher quality.

Federal WELDERS ® Warco PRESSES ®

The Federal Machine and Welder Company
WARREN, OHIO

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread).
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary

CUTTING COMPOUNDS

See Compounds, Cutting, grinding, Etc.

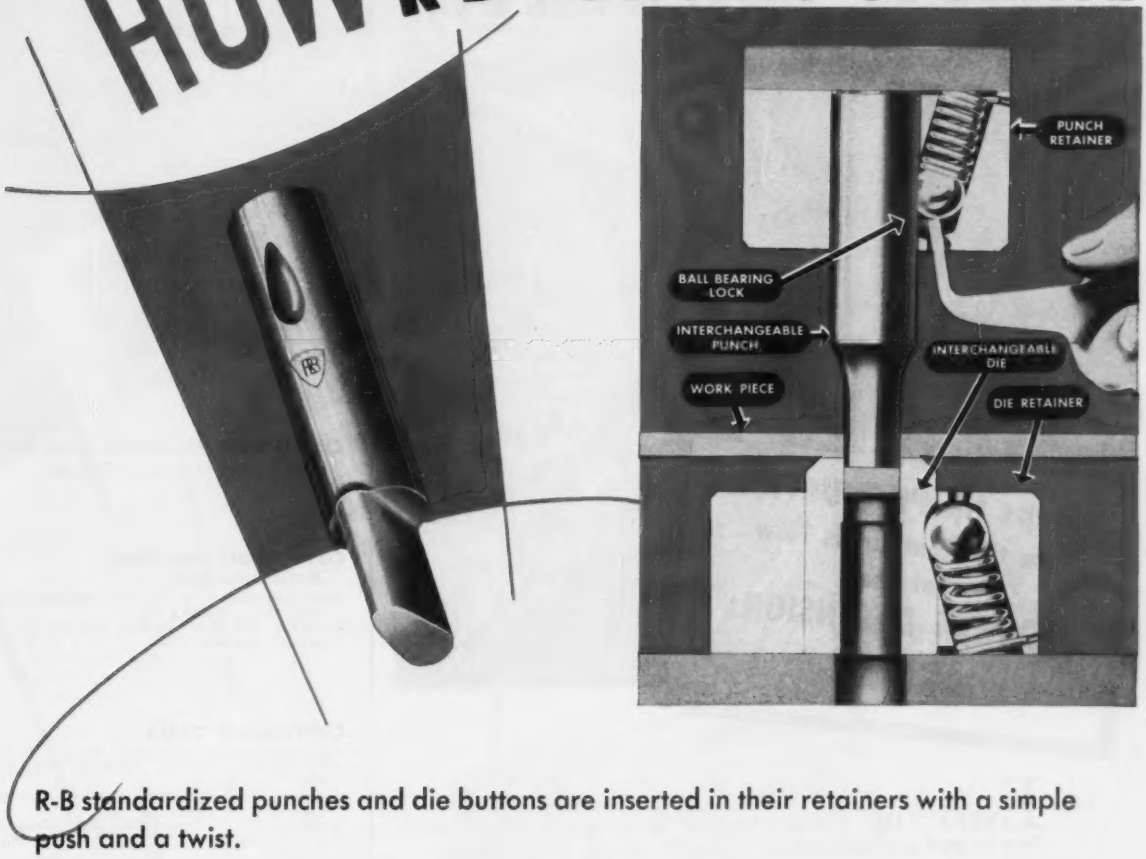
CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(*Continued on page* 320)

For more information on products advertised, use Inquiry Card, page 257

HOW R-B PUNCHES OPERATE



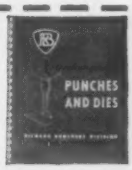
R-B standardized punches and die buttons are inserted in their retainers with a simple push and a twist.

Punches and die buttons are instantly removed by inserting a tanged tool in retainer hole to release the locking ball.

Each R-B retainer is equipped with a spring-loaded locking ball which engages the recessed portion of standard and special R-B punches and die buttons. Locked punches and die buttons are always accurately aligned—no additional keying is required.

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 76 • 12619 BURT RD. • DETROIT 23, MICHIGAN



Please send me additional information.

NAME_____ TITLE_____

COMPANY_____

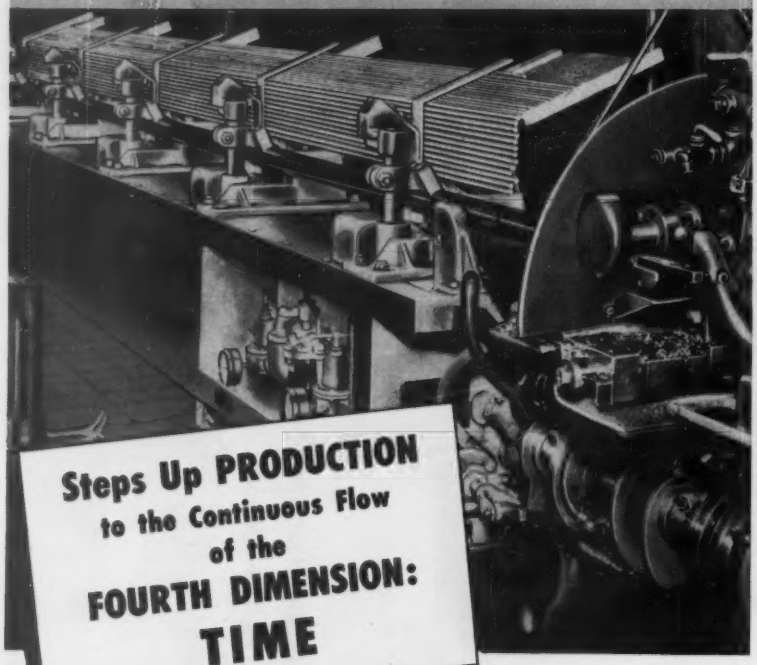
ADDRESS_____

CITY_____ ZONE_____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

For more information on products advertised, use Inquiry Card, page 257

Now... A Screw-Machine-Feed that BREAKS THE TIME BARRIER!



Steps Up PRODUCTION to the Continuous Flow of the FOURTH DIMENSION: TIME

EVERY TIME a screw machine cuts air... every time feed fingers are adjusted or replaced... every time remnant removal forces a shut-down — *that's time lost forever, never again to be made up in the production quota!*

In the modern Lipe Automatic Magazine-Loading Bar Feed, we present a continuous-feed mechanism that utilizes *every minute* of the working day for production...and still more production.

There's *No* cutting air. *No* feed fingers. *No* remnant problem. *No* minimum or maximum run. *No* limit on length of feed. *No* selective stock length requirement.

There IS a definite increase in production — up to 100% on some installations — *at least 30% on every one!*

Send today for FREE BOOKLET giving full details on Lipe's AML Bar Feed — today's big advancement in screw machine stock feeding. We will also supply name of your nearest distributor.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa., (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1 Ohio.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Grob, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

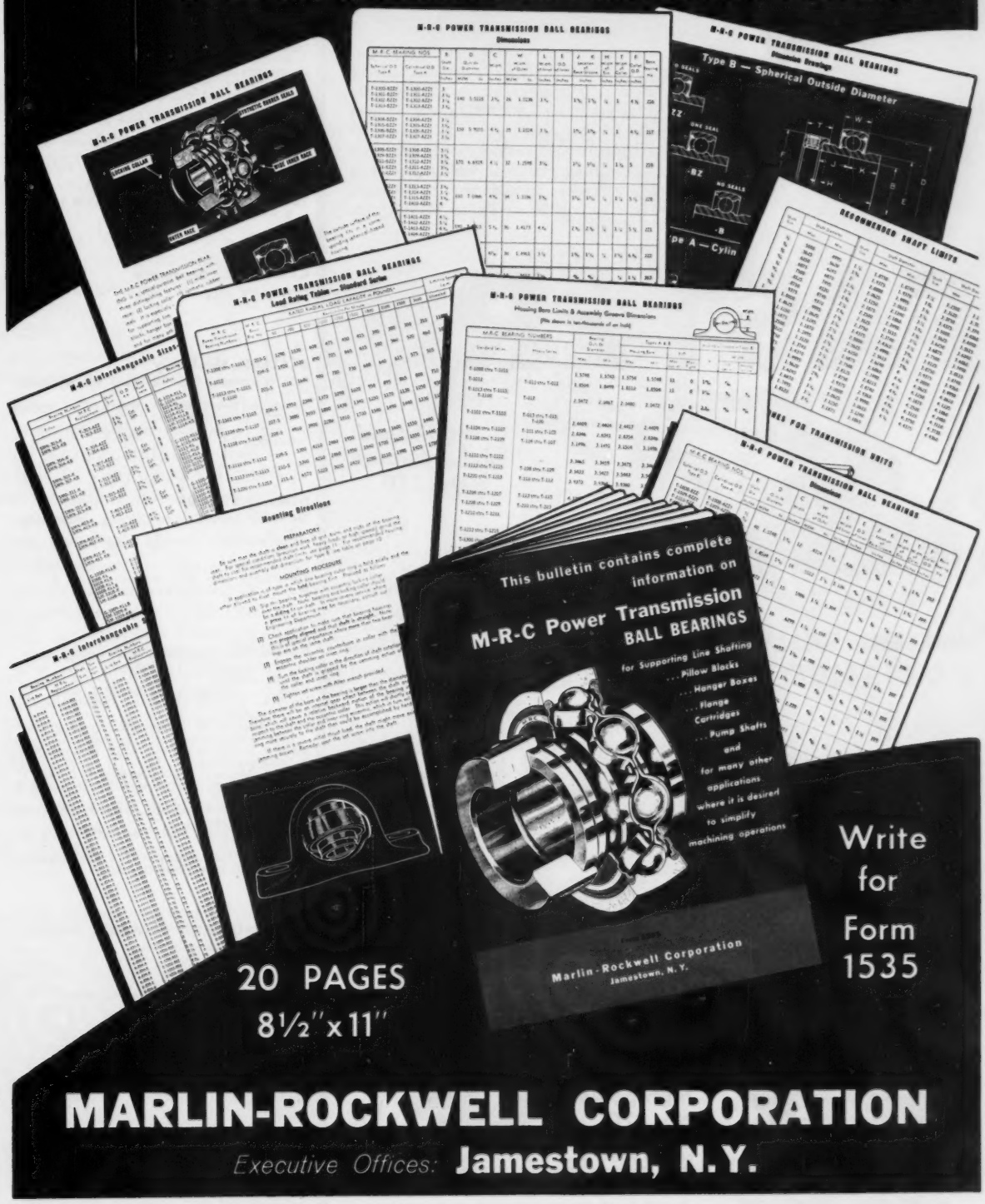
(*Continued on page 322*)

For more information on products advertised, use Inquiry Card, page 257

New catalog — complete information on

M-R-C POWER TRANSMISSION BALL BEARINGS

with M-R-C Synthe-Seals — the most effective of all seals, excludes dirt and retains lubricant


M-R-C POWER TRANSMISSION BALL BEARINGS
Dimensions
M-R-C POWER TRANSMISSION BALL BEARINGS
Dimension Drawings
Type B — Spherical Outside Diameter
Type A — Cylin
M-R-C POWER TRANSMISSION BALL BEARINGS
Load Rating Tables — Standard Series
M-R-C POWER TRANSMISSION BALL BEARINGS
Housing Bore Limits & Assembly Groove Dimensions
RECOMMENDED SHAFT LIMITS
Mounting Directions
PREPARATORY
MOUNTING PROCEDURE
This bulletin contains complete information on
M-R-C Power Transmission BALL BEARINGS
for Supporting Line Shafting
... Pillow Blocks
... Hanger Boxes
... Flange Cartridges
... Pump Shafts
and
for many other applications where it is desired to simplify machining operations
Marlin-Rockwell Corporation
Jamestown, N. Y.

20 PAGES
8½" x 11"

Write for Form 1535

MARLIN-ROCKWELL CORPORATION

Executive Offices: **Jamestown, N.Y.**

FOR

New, light-weight, heavy-duty No. 404

MILLERS FALLS GRINDERS

Latest addition to Millers Falls famous line of portable electric grinders, the No. 404 weighs only 9¼ lbs., yet has a 5.5 amp. rating. It uses 4" diameter wheels up to 1" wide and is designed for continuous heavy-duty service such as snagging castings, grinding welds, grinding off rivets, etc. Other models up to 6" with speed ranges from 3700 r.p.m. to 5500 r.p.m.

FASTER

High-speed, high-powered No. 270

MILLERS FALLS POLISHERS

This husky, recently-introduced Millers Falls Polisher has the extra power (a full 5 amps.) and greater spindle speed (1900 r.p.m.) needed for best results with the latest type cleaners and polishes that are proving so popular. It's light, compact, pleasant to use — and it's supplied with a deep, carpet-pile wool pad, the most effective polishing head ever developed.

FINISHING

MILLERS FALLS SANDERS

A beautifully engineered 7" unit, the 870 weighs only 7½ lbs., but carries a full 5.5 amp. rating and can handle continuous operation. Its no-load speed of 4500 r.p.m. makes it perfect for driving the new laminated phenolic grinding wheels and discs as well as for fast sanding. Other models available up to 9".

Light, high-power No. 870

MILLERS FALLS TOOLS SINCE 1868

The Mark of Superiority

FREE — Write for literature on Millers Falls wide line of portable electric grinders, polishers, sanders, drills, saws, screw drivers and other high-performance tools. Demonstrations gladly arranged on request.

MILLERS FALLS COMPANY, Dept. M-7, Greenfield, Mass.

CYLINDERS, Air
Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic
Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

CYLINDERS, Pneumatic
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.

DEALERS, Machinery
Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

DEMAGNETIZERS
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS
Christensen Diamond Prod., 1937 S. Second West, Salt Lake City, Utah
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING
See Castings, Die.

DIE-CASTING MACHINES
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

(*Continued on page 324*)

For more information on products advertised, use Inquiry Card, page 257

7 benefits received by switch to STANOSTAMP *Compound C*

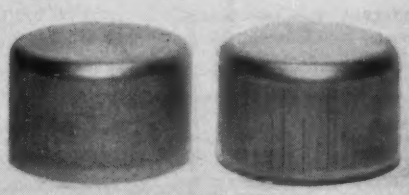
Jagemann Stamping Company, Manitowoc, Wisconsin, benefited seven ways by switching to STANOSTAMP Compound C. Finished ferrules drawn from 19 gauge cold roll steel were being badly scored. At the same time dies were being scratched and excessive heat experienced in the press. Standard Oil lubrication specialist R. E. O'Brien suggested STANOSTAMP. The result:

1. Production increased 20%
2. Die maintenance reduced 30%
3. Spoilage reduced
4. Finish improved
5. Galling minimized
6. Cooler machine operation
7. Washability improved

The results add up to this: There is a combination in the field of industrial lubrication that is hard to beat. It is (1) Standard Oil lubrication specialists capable of giving technical help and (2) Top quality products *that deliver results.*

STANOSTAMP Compound C is a water emulsifiable paste for heavy drawing operations. It contains an inert, non-abrasive mineral filler for protection of dies and work, is readily cleaned from work in conventional washing equipment. In the Midwest, your nearby Standard Oil lubrication specialist will be glad to tell you more about STANOSTAMP. Call him. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Father and son inspect ferrules. William P. Jagemann (left), President, and son William T. Jagemann note improved finish on work produced using STANOSTAMP.



Air hose ferrules. One at right produced before switch to STANOSTAMP, one at left produced after conversion to this forming compound. Scoring of dies as well as work occurred before switch.

STANDARD OIL COMPANY
(Indiana)

STANDARD

"THIS LUBRICANT ENABLED US TO INCREASE PRODUCTION"

says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

R. S. Vorous
Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Grob, Inc., Grafton, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.

DIE SETS, Standard

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.
Wales-Strippet Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St. Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

DIE STOCKS

See Stocks, Die

DIES, Sheet Metal, Etc.

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept, General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Mullins Mfg. Corp., Salem, Ohio.
Niagara Mch. & Tool Wks. 683 Northland Ave., Buffalo, N. Y.
Richard Bros. Div. of Allied Products, 26500 Capitol Ave., Detroit 23, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS

Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment.

DOWELL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32 Mich.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

(*Continued on page 326*)

OILGEAR FLUID POWER DRIVES

Solving the problem of close synchronization of driven members

As machines become more and more complex, combining more and more functions into a single unit, the problem of driving these machines successfully becomes more difficult.

This problem confronted Western Electric Company engineers in designing what they call their "Stalpeth" machines, two of which are shown above. These machines combine corrugating of steel and aluminum strips, forming them around the cable core, soldering the seam and then winding the assembly on reels at the far end. All of the members of the machine must be synchronized to the speed of the capstan unit. Going by their experience with other somewhat similar machines, Western Electric engineers again turned to Oilgear *"Any-Speed"* Fluid Power Drives, to solve what is really a complex problem ordinarily. Oilgear units provided an easy and economical means of synchronizing many machine components.

Oilgear *Any-Speed* Fluid Power Drives and transmissions *do* offer many machine design advantages including ease of control and synchronization of driven members, steplessly variable speed, fundamentally simple circuits, and long, trouble-free life. Write for Oilgear drive bulletins. THE OILGEAR COMPANY, 1569 W. Pierce St., Milwaukee 4, Wisconsin.

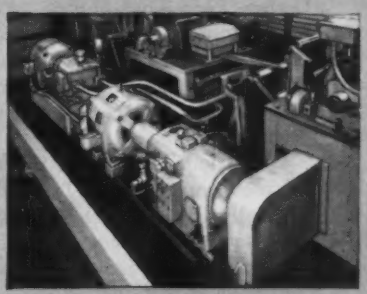
OILGEAR
Fluid Power

PIONEERS . . . NOW THREE PLANTS FOR FLUID POWER

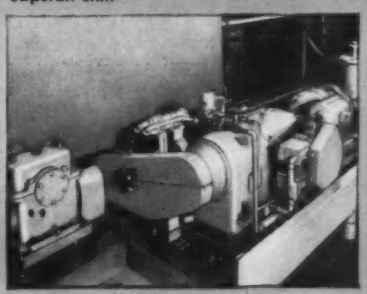
PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS AND VALVES

"Stalpeth" machines add moisture barriers to telephone cable

These machines receive cable core, wrap it in aluminum and steel, solder the seam and coil it on reels. Oilgear *ANY-SPEED* Fluid Power Drives are an easy and economical means of synchronizing many machine units without a long lineshaft.



These Oilgear *ANY-SPEED* units drive the aluminum and steel corrugator units in perfect unison with the governing capstan unit.



The Oilgear *ANY-SPEED* capstan drive. Not shown here is another Oilgear unit driving the cable winding reels.

Clamp power to production

Models MTU (above, left) and MTS (above, right) Multiple Plate Clutches are available in dry or oil types. Sizes 3" to 12", working capacities .47 to 44 hp per 100 rpm. Request Bulletin 134-B.

Design Twin Disc Models MTU, MTS Multiple Plate Clutches into your machines . . . *and you provide the capacity to effectively transmit higher loads required for maximum production.*

With comparatively *low* pressure on the control lever, Twin Disc Multiple Plate Clutches provide *high* clamping efficiency. Add their *short* travel, and you have minimum clutch length . . . *permitting high torque capacity to be designed into minimum space.* To maintain high torque capacity, the Models MTU, MTS feature materials with high friction coefficient, plus an ample number of friction surfaces.

Also important, Twin Disc Multiple Plate Clutches permit higher speeds of rotation, for their operating mechanism is designed to be *unaffected* by centrifugal action. Adjustment is single-point for time-saving simplicity. All sliding surfaces are specially hardened to eliminate possibility of scoring parts.

Whatever your requirement, Twin Disc can provide the right type, right size Multiple Plate Clutches for greater efficiency. The Models MTU (duplex) and MTS (single) are mechanically-actuated. New Twin Disc Models MOD (duplex) and MOS (single) Multiple Plate Clutches are oil-actuated, with the floating or pressure plate acting as the cylinder ram.

Be sure to write Twin Disc Clutch Company, Racine, Wisc. today for detailed information.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Seattle • Tulsa

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 400 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Etta Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Govro-Nelson Co., Detroit 8, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St. Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STOPS

Wohlnip Products, Inc., 634 Central Ave., East Orange, N. J.

DRILLING MACHINES, Automatic

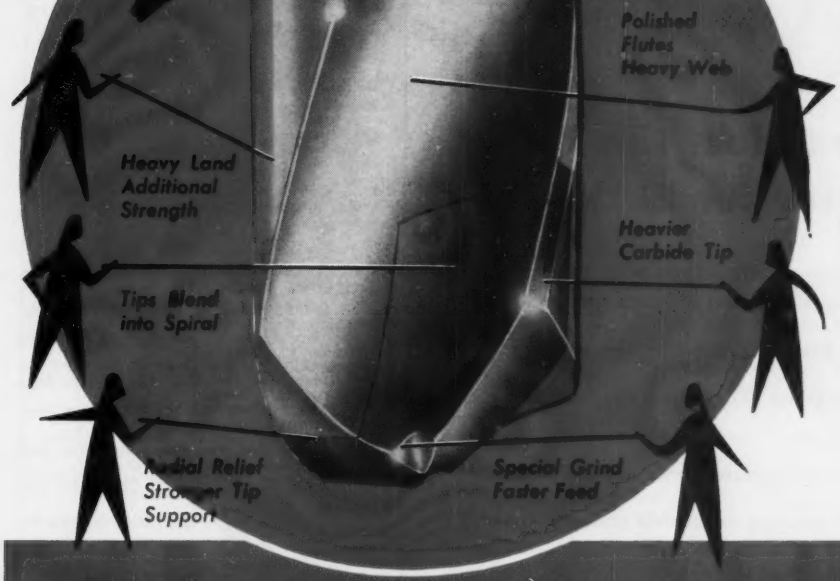
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

(*Continued on page* 328)

For more information on products advertised, use Inquiry Card, page 257

For Every Carbide Drilling Application There's a STANDARD SUPER DRILL

NEW and really super!



Six points of superiority—Result of two years' research. Extensive tests indicate it's the most durable and the fastest cutting carbide twist drill developed to date. Feeds as high as 8" per minute in cast iron have been obtained. Stocked in fractional, wire and letter sizes for your convenience.

NEW LOW PRICES

Write to Dept. 362 for new Catalog No. 55

QUALITY CARBIDE TOOLS

Super TOOL COMPANY

21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

To Help You Select the Best Speed Reducer for Each Job

Horsburgh & Scott's new catalog provides you with all the information necessary for the proper selection of speed reducers.

- Complete size range available, including new sizes.
- New ratios and ratings for Worm Helical Speed Reducers shown.
- Increased Overhung Load capacities are listed and explained.
- Detail dimensions of standard worms and gears are given to help you "build-in" Horsburgh & Scott Speed Reducers.
- New Rating Tables—more complete than ever before—easier to use.
- Engineering Data Section—more tables and data you want.

All this information and much more is available in this catalog to you for the asking. Just write us on your letterhead for catalog 55—no charge, no obligation.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

Consolidated Mch. Tool Corp., Rochester, N.Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch Co., 126 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Conedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLING MACHINES, BOILER

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

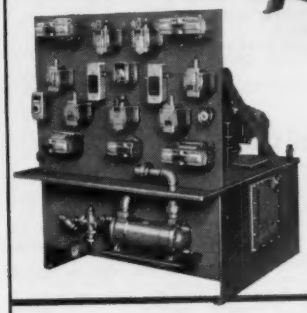
DRILLING MACHINES, Horiz.

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.

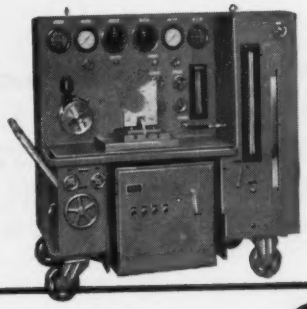
(*Continued on page 330*)

For more information on products advertised, use Inquiry Card, page 257

Pulpit type power unit provides full visibility, easy accessibility.

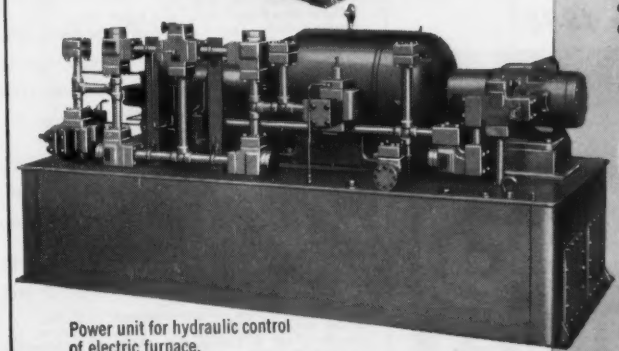


Compact power unit showing gasket-mounted valves.



Portable power unit for testing pumps.

Power unit with gasoline engine as prime mover.



Power unit for hydraulic control of electric furnace.

6837

Individually Designed to Meet *SPECIFIC* Needs

VICKERS®
Custom Built
HYDRAULIC POWER UNITS

DEPENDABLE PERFORMANCE

IMPROVE AND SIMPLIFY DESIGN

REDUCE INSTALLATION COST AND TIME

EASIER SERVICING

BETTER APPEARANCE

Vickers engineers approach the design of a custom-built hydraulic power unit from the standpoint of the customer's INDIVIDUAL needs. The sole objective is to meet HIS requirements with the best hydraulic "package". This assures the most compact, efficient and convenient hydraulic equipment for the particular machine.

A Vickers Hydraulic Power Unit includes all necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., as well as all hydraulic accessories (oil filters, air cleaners, oil level gauges, fittings, etc.). Hydraulic connections can be grouped in a convenient manifold.

In addition to the advantages mentioned above, each Unit is pretested at the factory and ready for immediate operation. Vickers undivided responsibility for the entire hydraulic control system is also an important feature to both the machine builder and his customer. Write for Bulletin 52-45.

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

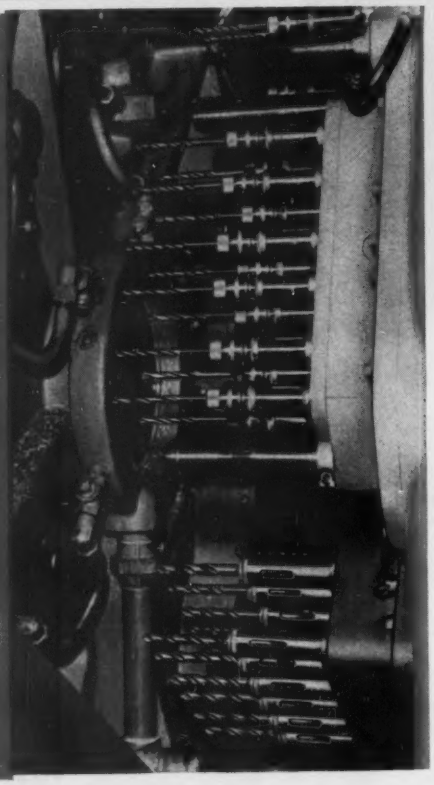
1403 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: **• ATLANTA • CHICAGO AREA (Brookfield) • CINCINNATI • CLEVELAND • DETROIT • HOUSTON LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA • (Berkeley) • SEATTLE • TULSA • WASHINGTON • WORCESTER**

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

W&B

HIGH SPEED *and* CARBIDE DRILLS *provide* BETTER PRODUCTION DRILLING



Pictured is the production drilling and reaming of bolt holes in connecting rod caps made from steel forgings. This horizontal multiple spindle machine in one of the largest automobile manufacturing plants in the country, uses 48 Whitman & Barnes drills and reamers in each set-up. In record time the bolt holes are drilled, chamfered, core drilled and reamed.

Throughout this mammoth plant W & B high speed and carbide drills are used on many other operations to secure maximum production, minimum down time for tool replacements and reduced manufacturing costs. If you want better drilling production—the durability and cutting speed of W&B drills are your answer.

Call your **W&B** *distributor for best service and highest quality*

He can save you money by supplying from his stock . . . what you need when you need it!

"Makers of Fine Tools Since 1848"

W&B

Please send me additional information

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

WHITMAN & BARNES

10040 PLYMOUTH ROAD · PLYMOUTH, MICHIGAN

NEW YORK · CHICAGO · LOS ANGELES · ATLANTA

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St. Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry, Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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For LARGE HOLES in TOUGH METALS *you need a . . .*

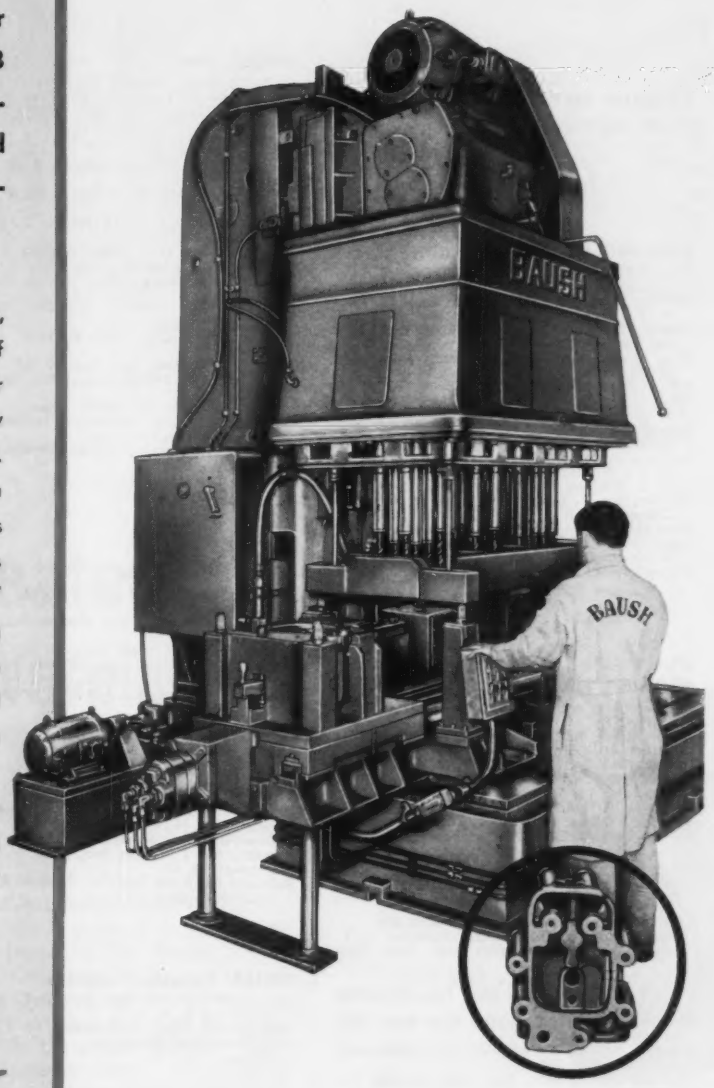
BAUSH HEAVY DUTY DRILL

. . . just as one large engine maker has selected the Baush Vertical W8 Hydraulic Multi-Spindle Drill illustrated for drilling, core drilling and reaming heavy diesel motor cylinder heads.

The experience and know-how of Baush, gained through more than 60 years of building equipment with a reputation for sturdiness, long life and extremely low "down time," is exemplified in such a unit.

Designed to operate with a 4-position sliding fixture this machine drills 16 holes from 21/32" dia. to 1½" dia., as well as core drilling 12 holes from 1-5/32" to 1½" dia. and reaming 2 holes to .871; making a total of 30 slip-sleeve spindles with nose adjustment incorporated in a special head 28" x 54" of the adjustable joint driven type, with master bored cluster plate.

30 H.P. 1800 R.P.M. spindle motor arranged for Texrope drive furnishes drilling power and a 7½" H.P. 1800 R.P.M. motor drives hydraulic pump.



BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Why not send us your heavy duty machine problems TODAY — our engineers will gladly work out your operations to give maximum production with lowest operating, as well as maintenance cost.

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th nad N. Sts., Richmond, Ind.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Carboloy Dept., General Elecric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 9, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLS, Rachet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Spade

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

DRILLS, Subland

Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.

DRILLS, Twist

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St. Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel

EMERY WHEELS

See Grinding Wheels

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Drill

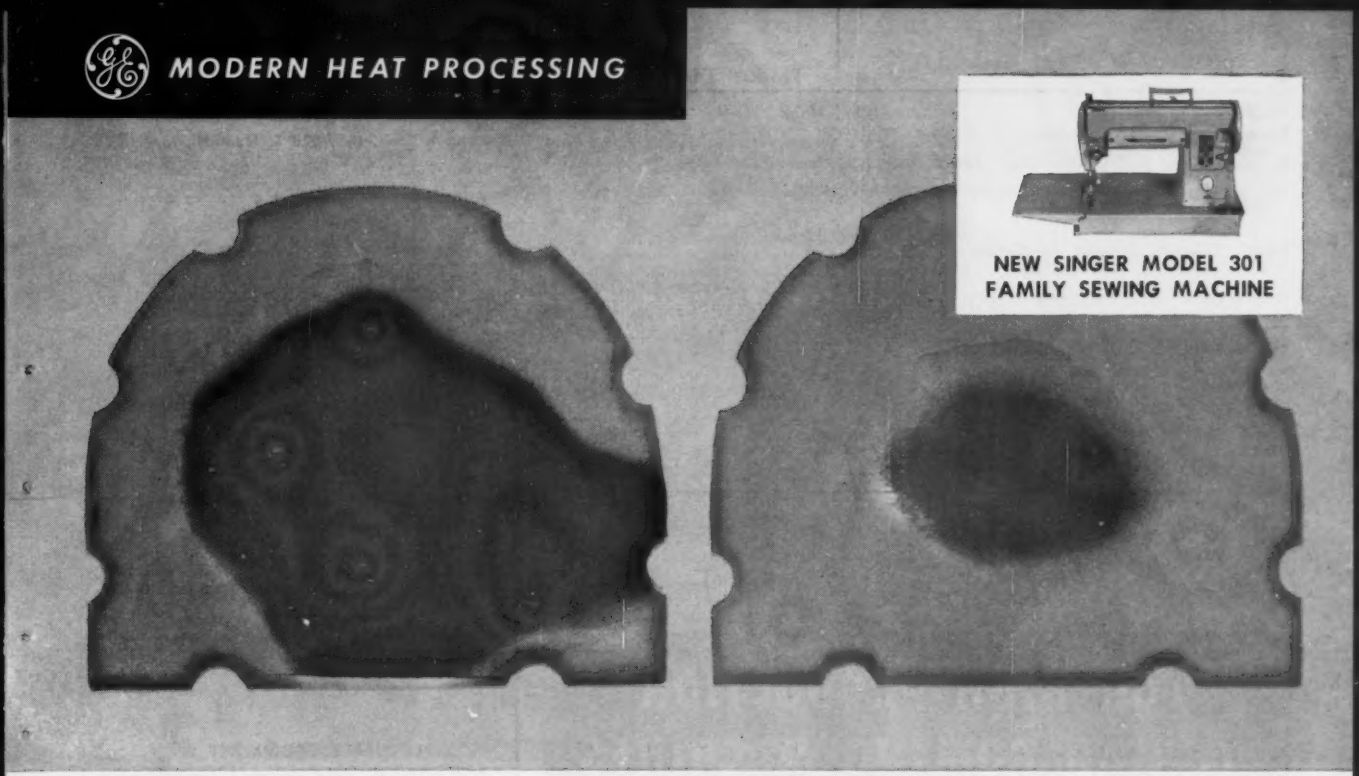
Wahlnip Products, Inc., 634 Central Ave., East Orange, N. J.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 334)

MODERN HEAT PROCESSING



NEW SINGER MODEL 301
FAMILY SEWING MACHINE

OLD METHOD hardened too much of part area, causing warpage. **G-E INDUCTION HEATER** cuts heat-treated area 75%—warpage reduced.

PROBLEM:

Old method of hardening SINGER Sewing Machine parts caused warpage, doubled costs

SOLUTION:

G-E Induction Heater "Pinpoints" Heat Reduces Costly Warping of Treated Parts

The Singer Manufacturing Company, Elizabethport, N. J. was having trouble hardening parts for its sewing machines. Only a small area in the high-carbon steel item needed hardening. But too large an area was being heated with the fuel-fired method used. This resulted in warpage. And subsequent straightening of the part was required. Result—high labor costs and production slowdowns.

A G-E 5-KW INDUCTION HEATER was selected because of its greater selectivity in heating the required area. Now the affected area is "zeroed in" with induction heat. The heated area is reduced 75%, thus greatly reducing the costly warpage. As a result, at least twice as many of these parts per day are being produced with the new 5-kw induction heater for the new SINGER 301 family Sewing Machine.

THE OVER-ALL IMPROVEMENT was explained by the manager of the heat-treating department of The Singer Manufacturing Company: "This method of heating has reduced the area affected by high temperatures to one-quarter of that obtained by the former method. With the G-E induction heater, the warpage is greatly reduced and straightening is no longer a problem. This improvement has produced more uniformly graduated marking on the finished parts and helped us to cut cost."

GENERAL ELECTRIC

G-E 5-KW INDUCTION HEATER

with variable tap transformer, handles jobs formerly requiring larger heaters.

For application assistance, contact your nearest G-E Apparatus Sales Office or send coupon for free bulletin GEC-920B.

General Electric Company
Apparatus Sales Division, Section C722-1
Schenectady 5, New York

Name.....

Position.....

Company.....

City.....**State**.....

FACING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating
Buffalo Forge Co., 490 Broadway, Buffalo N. Y.
General Electric Co., Schenectady 5, N. Y.

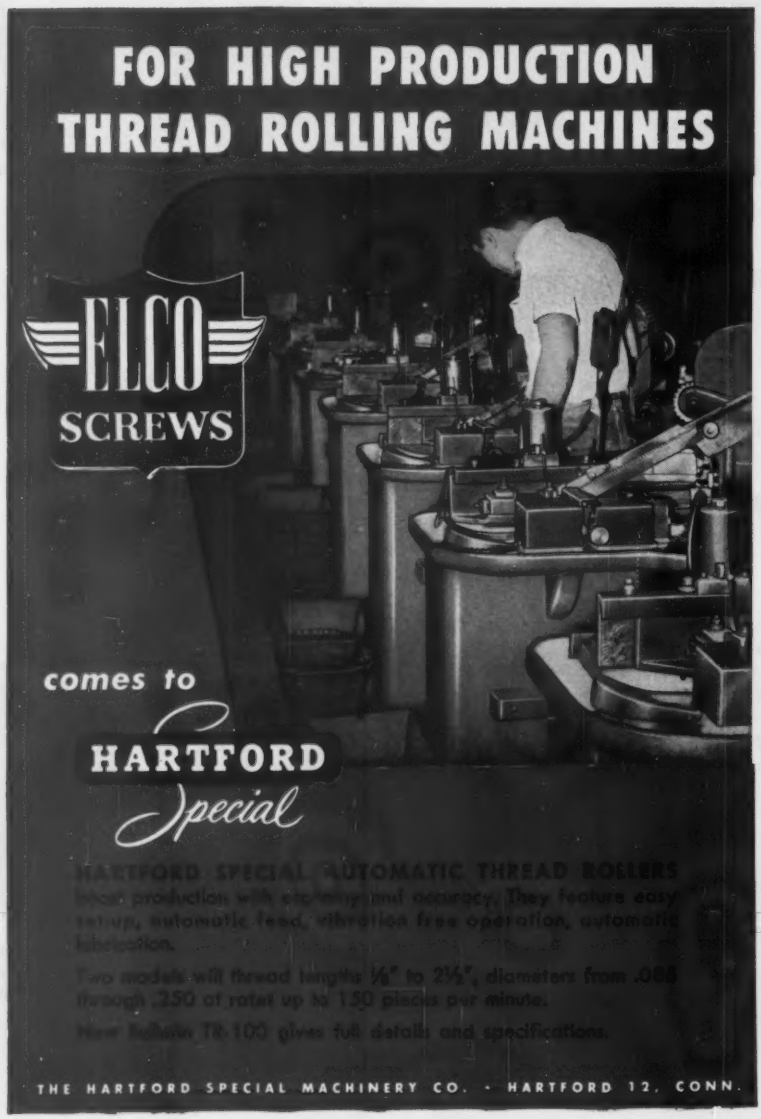
FEEDS FOR PRESSES, Automatic
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications
American Felt Co., Glenville, Conn.

FILES, Hack
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.



FILES AND BURS, Rotary
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Coolant and Oil
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

FINISHES FOR MACHINES AND METAL PARTS
Lowe Bros. Co., Dayton, Ohio.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

FLEXIBLE COUPLINGS
See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT
Pratt & Whitney, West Hartford 1, Conn.

FORGINGS, Machines (Upsetting)
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

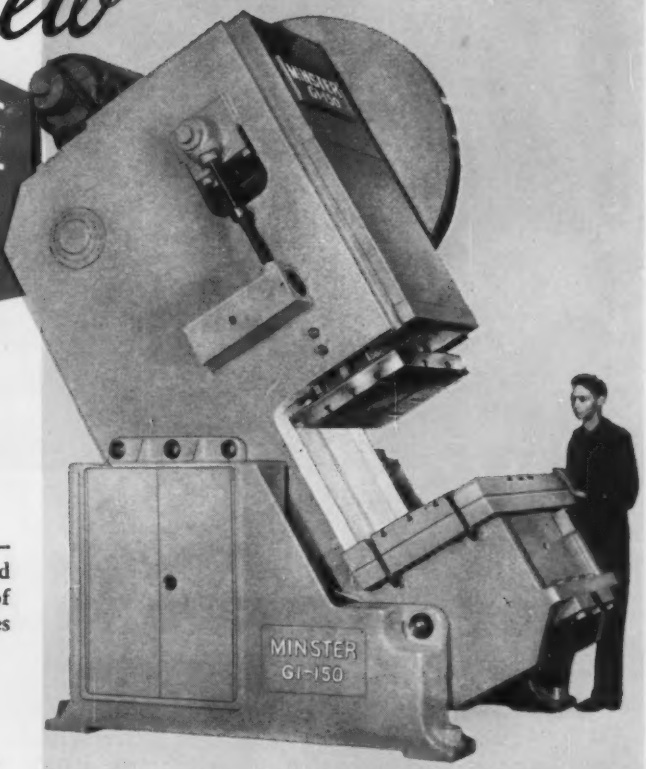
FORMING AND BENDING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.

(*Continued on page* 336)

For more information on products advertised, use Inquiry Card, page 257

Minster announces a completely New

STEEL FRAME GAP PRESS

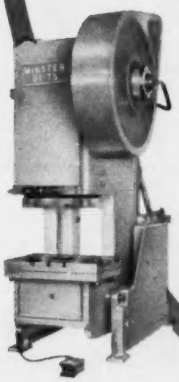


MINSTER G1-150 ton geared type gap press—Motorized Inclining—Cabinet Legs house all electrical and air controls—Connect Air Line and Plug in power; in seconds, it's ready to operate.

SERIES G1 PRESSES

Patents Pending

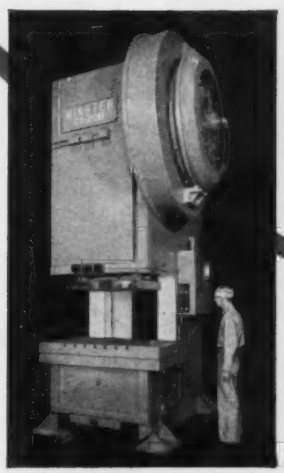
Today's most rigid and efficient gap presses—G1 Steel Frames, are engineered and fabricated with a completely new approach to the problem of achieving minimum deflection in steel "C" frames for gap presses.



CAPACITIES OF
75, 110, 150 and 200 Tons

- Fixed Base or Inclinable
- Flywheel or Geared Types
- Minster Patented Combination Air Friction Clutch and Brake
- Barrel Slide Adjustment and extremely long Slide Ways
- Power Inclining

Series G1-75 flywheel type inclinable gap press with manual inclining and standard leg.



The 200 ton G1 fixed base geared type gap press—Available with either bed attached or sliding type die cushion.

CONDENSED STANDARD SPECIFICATIONS

CAPACITY	STD. STROKE of slide	STROKES per minute	BED AREA	SLIDE AREA
75 tons	4	Flywheel 90 or 120 Geared 40	24 x 36	18 x 24
110 tons	5	Flywheel 80 or 105 Geared 37	27 x 42	21 x 28
150 tons	6	Flywheel 80 or 105 Geared 30	30 x 50	24 x 34
200 tons	8	Geared 28	34 x 58	28 x 36

Build a sound replacement program modernize with Minster Presses

MINSTER®
PRESSES

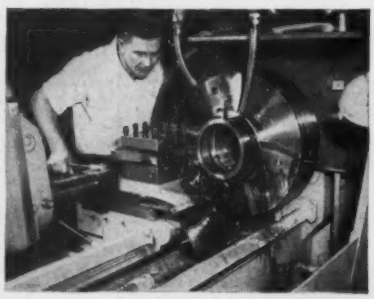
THE MINSTER MACHINE COMPANY, MINSTER, OHIO

W+B INDUSTRIAL LUBRICANTS

For 67 Years
LUBRICATION ONLY

Out of the W & B labs have streamed a long succession of lubrication specialties: transparent grinding coolants . . . paste-form and fluid-type water solubles . . . concentrated bases to blend and fortify metalworking lubricants . . . oils for critical grinding, honing . . . and dozens of others. You see, for over half a century W & B has stuck to its own particular last — designing lubricants that keep production up, machining costs down. Successfully, too. Ask any top machine operator.

Take W & B Grinding Concentrate 1500. This transparent water-soluble lubricant for grinding ferrous metals and titanium is used as thin as 200 to 1. Yet it keeps grinding wheels unusually open, settles chips almost instantly, stays virtually foam-free.



Do *you* have a lubrication headache? Ask us, without obligation, to send a W & B Lubrication Expert into your plant to consult with you.

THE WHITE & BAGLEY CO.

Established 1888

Worcester Detroit

Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FORMING TOOLS or Tool Blanks

Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H. Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

(*Continued on page* 338)

For more information on products advertised, use Inquiry Card, page 257

MERCURY special machines

The new Mercury Copymill is a traveling-bridge machine with three-dimension contouring control and a table that pivots on the longitudinal axis. Work bed length is unlimited—table width up to ten feet.

Wing skins and spars for airframe construction are accurately machined from solid aluminum with Mercury's high-speed Copymill. Incorporating many of the outstanding features developed for special Mercury machines, the ingenious Copymill is another example of Mercury versatility in the design and manufacture of specialized heavy-duty machine tools. You may find a quick and economical solution to your own machining problems with a Mercury-built machine.

MERCURY
ENGINEERING CORPORATION

Milwaukee 2, Wisconsin

Your Inquiry Is Invited

don't overlook dividends

THAT YOU CAN FIND RIGHT IN YOUR TOOLROOM

Modern dividend-paying companies constantly search for better production methods to capture bigger and better markets. The heart of more profitable production lies in modern, efficient toolroom techniques and equipment to provide tools for better and faster production.

You can find dividends right in your toolroom when you use Reid precision surface grinders — accuracy, convenience, dependable performance — yes, and many more features that translate into front office dividends.

Why not sit down right now and plan your share of these dividends by replacement of all your over-age grinders with new Reid Surface Grinders.

CONDENSED SPECIFICATIONS — Model 618V
Capacity: 6" x 18" x 17¼"
Work table: 51" x 8"
Power Feed: variable, 12 to 35 ft/min

Facts that mean money in your pocket are contained in our latest Bulletin 618-2. write for your copy today.

Reid Brothers Company, Inc.
BEVERLY, MASSACHUSETTS

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Starrett, The L. S., Co., Athol, Mass.

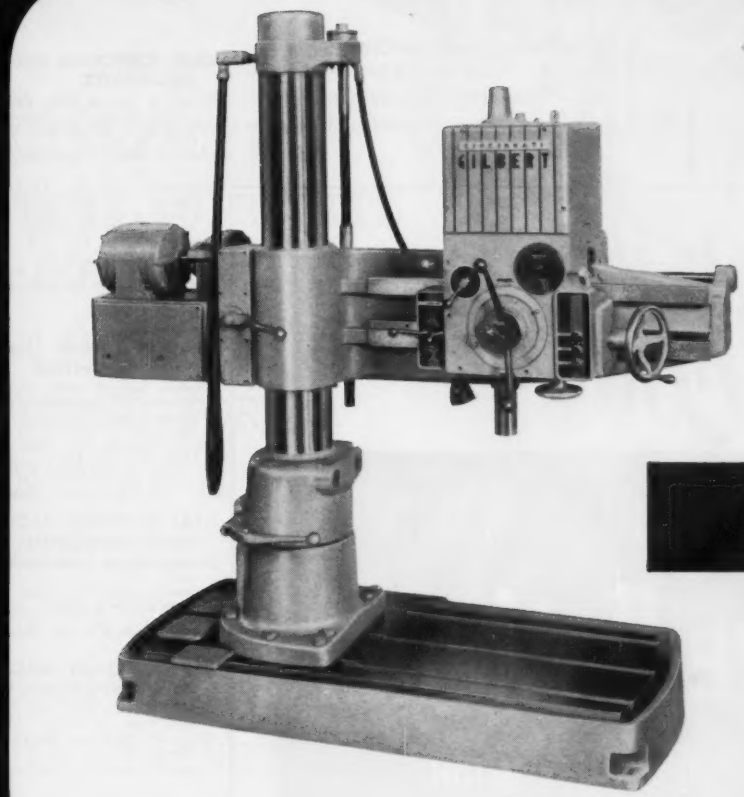
GAGES, Plug, Ring and Snap

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Elgin National Watch Co., Aurora, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co. Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Starrett, The L. S., Co., Athol, Mass.

(*Continued on page* 340)



NEW

- 9" column; 3' or 4' arm
- spindle speed ratio of 40-to-1
- 12 speeds (up to 3200 rpm) through direct-reading dial
- automatic tapping reverse
- adjustable spring counterbalance
(feel remains the same from lightest to heaviest tools)
- hardened tang slot
- safety elevating nut and screw (arm can't drop or overrun)
- rigid, accurate spindle mounted on 5 precision ball bearings

This *completely new* light duty 3 HP radial gives you more advances for your money than any machine of equal capacity, at a price that makes replacement easy and attractive. At the left are some of the features that put you ahead when you own this Gilbert. Your replacement dollar is worth more when you buy a Gilbert. Write for Bulletin Number 255.

The Cincinnati Gilbert Machine Tool Co.,
3366 Beekman St., Cincinnati 23, Ohio

those who buy Gilbert buy **GILBERT** *again*

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

(Continued on page 342)

A NEW CONCEPT!

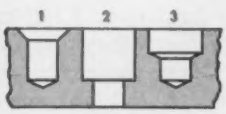
MOHAWK

Size-Optional

SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER

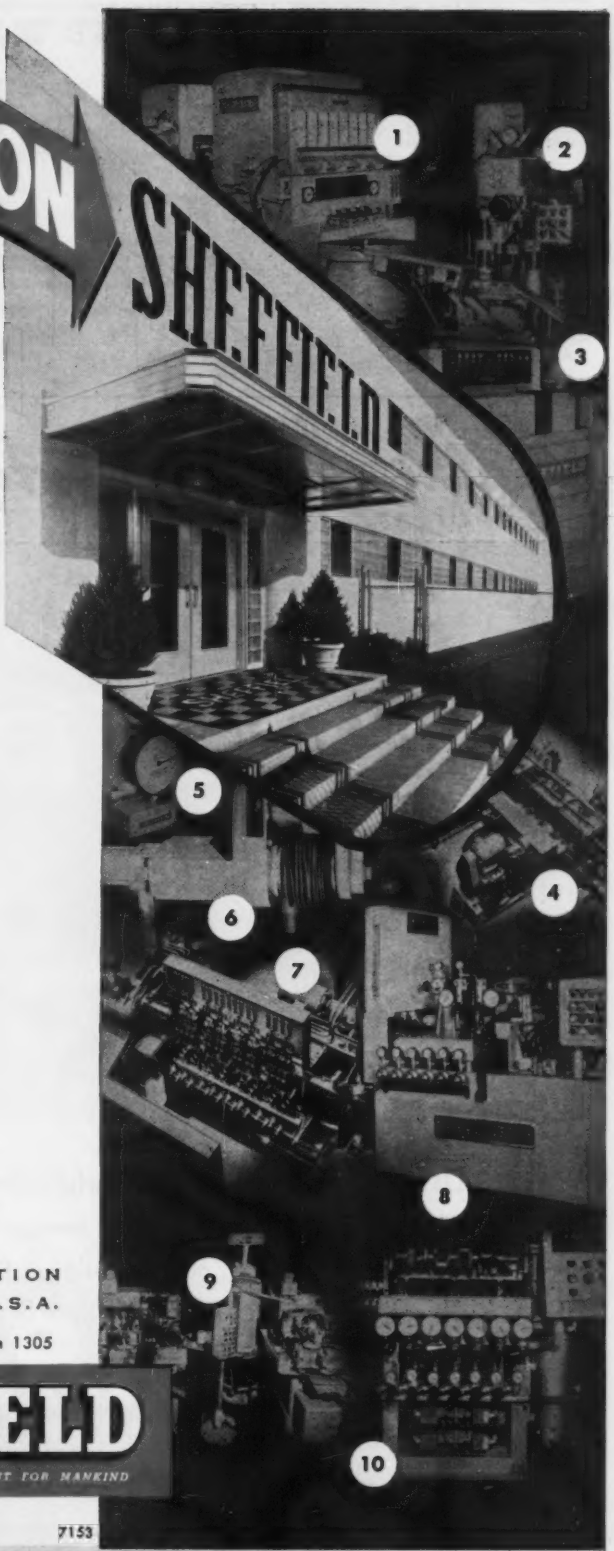
Mohawk
TOOLS, Inc.
918 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

For more information on products advertised, use Inquiry Card, page 257

AUTOMATION SHEFFIELD

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
DECADE. IT
WILL PAY YOU
TO CHECK YOUR
NEEDS AGAINST OUR
EXPERIENCE



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THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.
See us at the
Machine Tool Show, Booth 1305

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD
MANUFACTURING AND MEASUREMENT FOR MANKIND

7153

1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

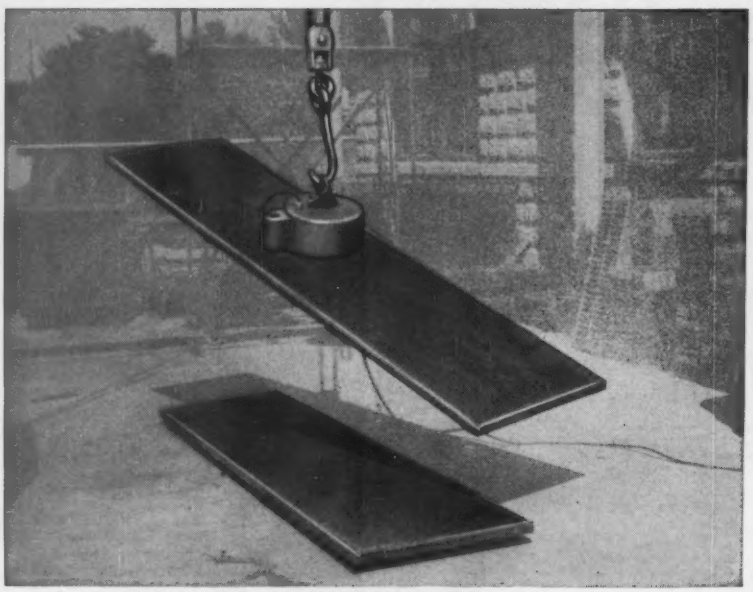
GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

Walker Does It Again-



WALKER LITTLE GIANT—the most powerful lifting magnet yet designed will lift 1000 pounds, utilizing less energy than the ordinary 150-watt kitchen lamp . . . can be designed for all voltages from a 6-volt car battery to 220-volt DC power line . . . practical for electric powered trucks and lifts.

Chucks: Rectangular, Swiveling, Rotary, Vacuum, Special Types . . . Demagnetizers . . . Planer Parallels . . . and Magnetic Hoists.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Lees-Bradner Co., Cleveland, Ohio
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.
New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Westinghouse Electric Corp., E. Pittsburgh, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

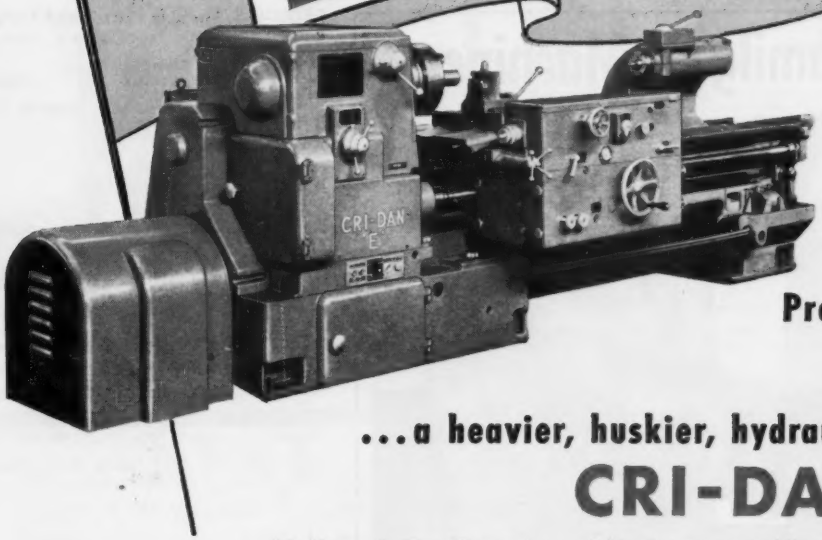
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.

(*Continued on page* 344)

For more information on products advertised, use Inquiry Card, page 257

CRI-DAN E

FOR EXCELLENCE in all Threading Operations



Presenting the "E"

...a heavier, huskier, hydraulically controlled

CRI-DAN

It's Here—At *Your* Request. Yes, the tremendous acceptance of Cri-Dan "B" and Cri-Dan "D" has resulted in the development of a larger, heavier precision threading machine greatly extending the range of the Cri-Dan Single Point Threading Method. Not only precision threading but secondary turning, boring, facing and chamfering facilities are incorporated in the Cri-Dan E; complete hydraulic and electric controls assure maximum efficiency even on the heaviest applications. A quick check of the specifications will show the ruggedness and range of this, the newest and finest Cri-Dan Single Point High Speed Threading Machine ever developed. Write The Lees-Bradner Company, Cri-Dan Division for specific information on the processing of your parts.

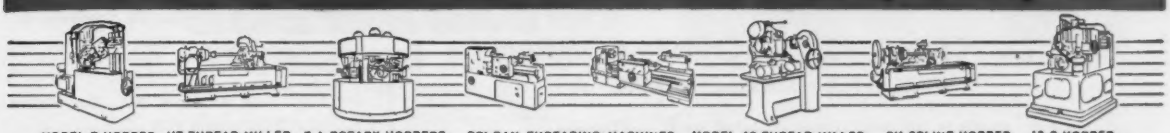
SPECIFICATIONS

Threading Range	2 TPI-48 TPI	Max. Taper of Thds.	15° Included
Max. Thd. Dia. (Internal)	16" Dia.	Multi-Start Threads	Yes
Max. Thd. Dia. (External)	12" Dia.	Spindle Speeds	50-1400 RPM
Max. Swing Over Ways	25" Dia.	Main Motor	20 H.P.
Max. Swing Over Tool Slide	12" Dia.	Floor Space Req'd	5'6" x 14'0"
Max. Thread Length	6½"	Approx. Weight	4½ Tons
Length Between Centers	2'6", 5'6" & 8'6"		

CRI-DAN DIVISION

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

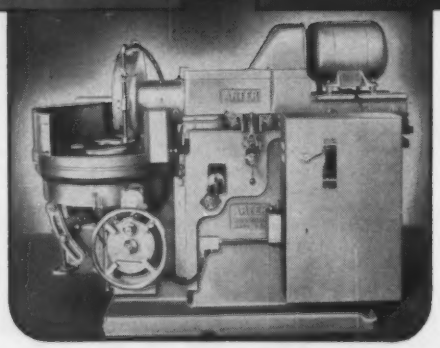
See Grinding Mches, Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

The Arter Family of Machines

CARBIDE TOOL GRINDERS



CYLINDRICAL GRINDERS

INTERNAL GRINDERS

ROTARY SURFACE GRINDERS

Chuck Capacity 8" to 40"

The Arter trademark on these machines is the sign of
ACCURACY • POWER • DEPENDABILITY.
Tell our engineers your grinding problems.
They'll find a way to lick them.

ARTER GRINDING MACHINE COMPANY
WORCESTER • MASSACHUSETTS

Agents in industrial centers of United States and Canada

Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivette Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

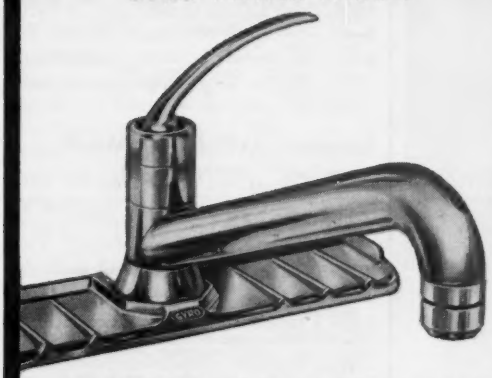
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page* 346)

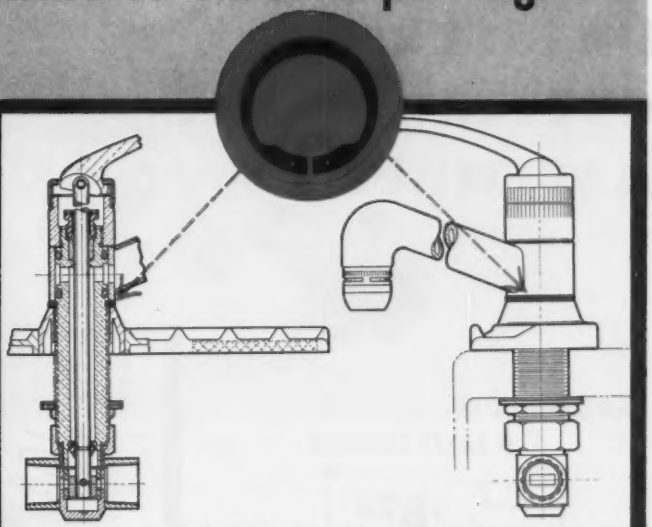
For more information on products advertised, use Inquiry Card, page 257

Waldes Truarc ring reduces valve body from 1 5/16" to 1 1/16", eliminates chrome plating

GYRO MIXING FAUCET



Single-handle kitchen mixing faucet controls hot and cold water, as well as volume. Radical design has no seals or spindles to replace. One Waldes Truarc retaining ring allows complete assembly and disassembly from either top or bottom of unit.



Aluminum Truarc Ring (external inverted Series 5108) acts as bearing retainer, insures precise alignment of spout and escutcheon, gives uniform shoulder with machining. Truarc ring provides shoulder that would otherwise require machining valve body to 1 5/16" against 1 1/16" used. Also eliminates expensive chrome plating of valve body.

Gyro Brass Manufacturing Corporation of Westbury, L. I., N. Y., uses a single Waldes Truarc retaining ring (Series 5108) both as a positioner and retainer on their Gyro Mixing Faucet. Aluminum Truarc ring not only eliminates expensive machining, but also does away with a chrome plating process that would be necessary if the shoulder were made of the solid material of the body.

You, too, can save money with Truarc Rings. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Waldes Truarc Rings are precision-engineered...quick and easy to assemble and disassemble.

More than 5,000 stock sizes of the different Truarc ring types available. Ninety stocking points throughout U. S. A. and Canada.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES
TRUARC®
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

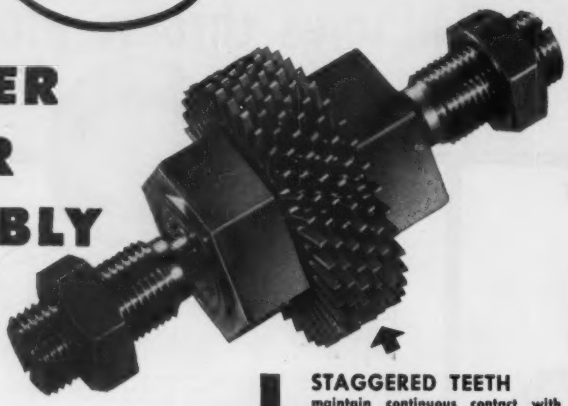
Name.....
Title.....
Company.....
Business Address.....
City.....*Zone*.....*State*.....

■ 047

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787. and other U. S. Patents pending. Equal patent protection established in foreign countries.

NEW! BESLY 2½" Wise Type

DRESSER CUTTER ASSEMBLY



● DRESSES BETTER
● LASTS LONGER

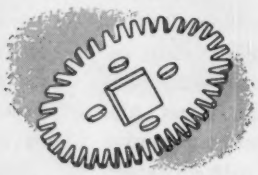
Costs only $825

Unlike broad toothed dressers, this new Besly Dresser Cutter Assembly sharpens abrasive discs *without crushing the surface.* Discs last longer, perform better. Grinding characteristics are not "softened" by the dressing action.

A unique "tru-square" spindle and interlocking spacer buttons lock cutters firmly in a staggered arrangement which provides a series of points of contact with the disc at all times. Non-staggered cutters "dig" into the abrasive—cause the dresser to vibrate and "bounce". Ball bearing holders provide almost frictionless rotation of the entire assembly. The new Assembly fits all Besly grinders using 2½" cutters and can be adapted to other dresser holders. Try one and cut your dressing costs. Send purchase order.

STAGGERED TEETH
maintain continuous contact with disc—prevent "digging" and dresser "bouncing" common to other dresser cutters.

CUTS INSTEAD OF CRUSHING
Slim fingers pick off abrasive grain, require less pressure than broad toothed cutters, last longer.



FASTER, EASIER ASSEMBLY
Raised buttons on cutter eliminate need for spacing washers. Replacement cutter sets are taped together for quick mounting and proper "stagger". Just slip on and remove tape.

NO CHEWED SPINDLES
Square arbor plus interlocking buttons replace easily worn keyways, maintain proper tooth "stagger".

Of Course You're Coming!

Be sure and see new Besly developments, including the Wise Type Dresser Cutter Assembly, the Besly-Bowen Radial Head Grinder that is making production records at leading metal-working plants, and other new Besly single and double spindle grinders.

BESLY

BESLY-WELLES
CORPORATION
Established in 1875 as Chas. H. Besly & Co.
112 Dearborn Avenue
BELOIT, WISCONSIN

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking

Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Drill

Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

(*Continued on page* 348)

For more information on products advertised, use Inquiry Card, page 257

Talking About Die Sets

WITH

PHIL MARSILIUS

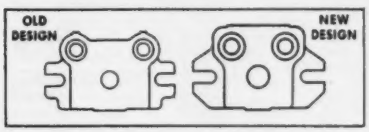
Vice-President
The Producto Machine Co.

9 Ways to Save on Special Steel Die Sets—Here are some suggestions that can save you money on machine work and shorten delivery time when you order special steel die sets: 1. Specify flame-cut edges, rather than machined edges, where possible. 2. Where close limits are not important, flame-cut clearance holes or cut-outs should be specified. Unnecessary machining increases cost. 3. For cut-outs requiring more accuracy than flame-cutting but less than machining, specify "saw-cut" to keep costs down. 4. On all types of cut-outs, keep radii in corners as large as possible.

5. Try to keep hole location tolerances as liberal as possible to reduce machining time. 6. On pin supports or bushing supports, welded construction is less expensive than dowelled and bolted construction. 7. On hold-down pads or flanges, the clamping slots should be flame-cut. 8. Bolt slots machined in pads should have one radius on the inside instead of two small radii corners. 9. Avoid special pins or bushings wherever possible.

★ ★ ★

A New Look in Die Sets—In case you haven't noticed, there's a new look in die sets. The new design offers these improvements: much more layout and mounting area on punch holders and die holders; maximum strength;



assurance of uniformly accurate location of pin and bushing holes. In addition, we felt that clean lines designed into a set would show the tooling to better advantage and make the completed unit look more like the precision instrument it really is. So you see, a die set can now make your work easier and your product better looking.

★ ★ ★

Proper Lubrication of Die-Set Pins and bushings helps to prevent seizing and galling, adds substantially to the life of your die sets. A new flexible reservoir type lubricator has been developed for this purpose. The guide bushings dip into the reservoir with each down stroke of the press, coating the entire pin with lubricant on the return stroke. It's an inexpensive way to get thorough lubrication for long periods of time without need of constant attention. Other lubrication methods will be discussed at a later date.

One of many major foundry improvements at Producto is this new continuous-pour operation which also provides continuous slag removal. The 12,000-lb. die set shown below is an example of the top-quality sets obtainable through Producto's "under-one-roof" service—pattern, casting and machining.

WHERE A BETTER DIE SET STARTS

Producto's newly-modernized foundry enables you to get higher-quality die sets...faster.

So extensive have been foundry improvements at Producto that little of the equipment or methods of two years ago remains. A new and larger cupola, stack, slag disposal unit, continuous-pour ladle, abrasive cleaning machine, sand conditioner, and conveyor systems for sand and molds have been installed.

FOR YOUR DIE SET REQUIREMENTS, THIS MEANS YOU GET:

HIGHER QUALITY sets, since Producto can produce a laboratory-controlled iron and steel mixture free of hard spots and blow holes.

FASTER SERVICE on catalog semi-steel sets, because combination of internal foundry and machine shop makes possible a full inventory at all times. Time from order to shipment never exceeds three days.

FASTER SERVICE on special semi-steel sets. A modern pattern shop in the plant expedites making patterns for your specials. No dependency on outside suppliers.

The improved foundry is but one of the reasons more and more die set users are specifying Producto. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
985 Housatonic Avenue, Bridgeport 1, Connecticut

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	New York	WO 4-7484
Chicago	ES 8-3307	Kansas City	VI 1162	Philadelphia	MO 4-1010
Cleveland	SU 1-6158	Los Angeles	TR 9826	Rochester	GL 1810
Dayton	MU 1651				

or check the Yellow Pages in any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With PRODUCTO ***Die Sets***

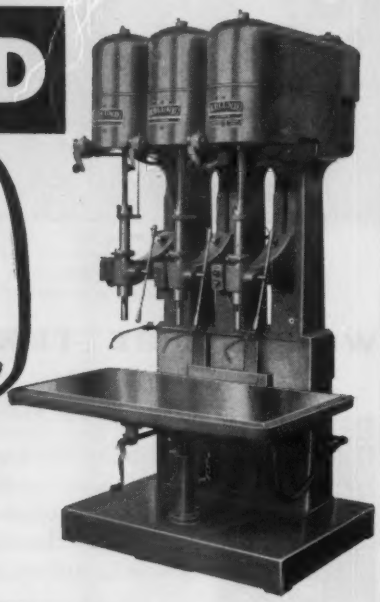
GRINDING MACHINES, Gap
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth
See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Dougias St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

EDLUND

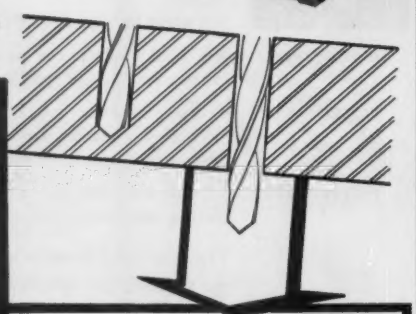
Cuts Cost $1280. . . .* On One Job.



An EDLUND 2F *Variable Speed* Drilling and Tapping Machine Makes the difference

The Edlund 2F instant change variable speed feature lets you find correct drilling speed under practical on-the-job conditions. Saves valuable production time. No gear or belt changes necessary. Increases tool life by using correct drilling speed for each job requirement.

Standard or Special Models, 1 to 8 Spindles. 8", 12" or 15" overhang — capacity to 1¼". Available with Power Feed, Reversing Motor Tapper, Lead Screw Tapper, and Back Gears.



The job . . . drilling 7/16" hole 1½" deep in X1020 steel. The Edlund Variable Speed machine drilled 135 pieces per hour compared with 108 pieces per hour for standard machine production. The 25% increase in production reduced costs $1280.*

Write for Bulletin #140, a colorful, illustrated booklet describing the Edlund 2F. Specifications and quotations prepared promptly on request . . . with no obligation on your part.

*Case history folder #SF on request.

EDLUND MACHINERY COMPANY
Cortland, New York Division of Bradley Edlund Corp. Affiliated with Precision Castings Co., Inc.

EDLUND REPRESENTATIVES IN MAJOR CITIES

GRINDING MACHINES, For Sharpening Turning and Planing Tools
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17 N. Y.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

GRINDING MACHINES, Jig
Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

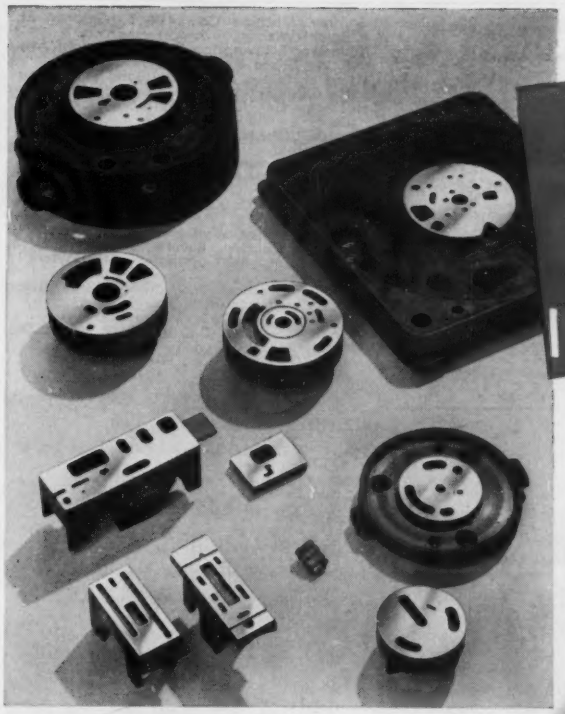
GRINDING MACHINES, Piston Ring
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GRINDING MACHINES, Ring Wheel Ball Race, Etc.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

(*Continued on page* 350)

For more information on products advertised, use Inquiry Card, page 257



Get Precision Flatness, Finish and Parallelity on Valve Parts Like These . . . In Production Quantities With a

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Air brake valve parts like these are being production lapped on JOHN CRANE Lapmasters every day at a tremendous savings in time and money. For instance, one of the rotary valve seats shown here formerly required over two hours of lapping time to pass the "no leak" bubble test — time has now been cut to ten minutes on the Lapmaster.

This is the machine for you if you are looking for precision flatness and finish in quantity on all forms of ferrous and non-ferrous metal, ceramics, plastics or crystals. Lapmasters readily lap to the extremely close tolerance of one light band (.000011") or less. They also produce a fine finish to as low as 1 RMS.

You are invited to send us a few sample parts including surface finish specifications and approximate production requirements. Our lapping laboratory will then be in a position to provide you with complete facts on the application of the Lapmaster to your work. There is no obligation.

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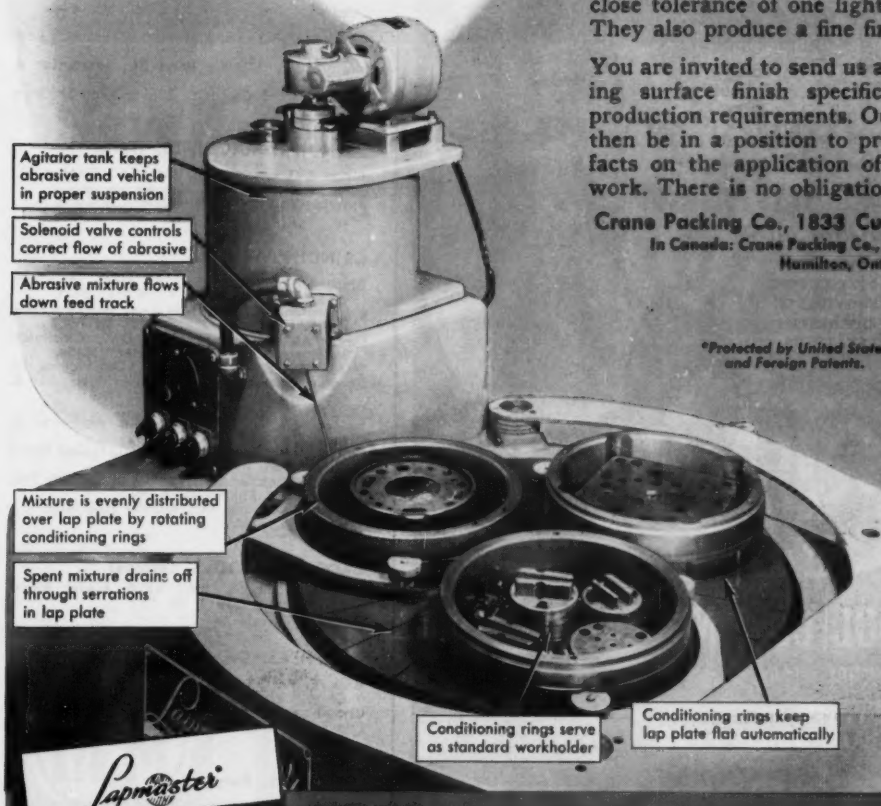
Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Spent mixture drains off through serrations in lap plate
Conditioning rings serve as standard workholder
Conditioning rings keep lap plate flat automatically

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FREE TECHNICAL DATA

on the Lapmaster is available on request, also information on measuring flatness. Write for your copies today.

Lapmaster DIVISION

CRANE PACKING COMPANY

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Sundstrand Mch. Tool Co 2531 11th St., Rockford, Ill.

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Mattison Machine Works, Rockford, Ill.
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Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
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Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
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Pratt & Whitney, West Hartford 1, Conn.
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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
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(*Continued on page* 352)

ALL NEW SELF-CONTAINED INJECTION END

ALL NEW SELF-CONTAINED CLAMP END

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The new H-P-M die casting machines are being hailed as the most important advancement in die casting in fifteen years, and rightly so . . . more than forty new and improved features! These features result in minimum mold flash . . . faster die set-up . . . greater versatility in die usage and casting design . . . reduced maintenance . . . maximum safety and performance. The new self-contained Link-Wedge mold clamp is the best. There's plenty of "beef" in these new models. They are available in a complete range of sizes . . . cold chamber or gooseneck types.

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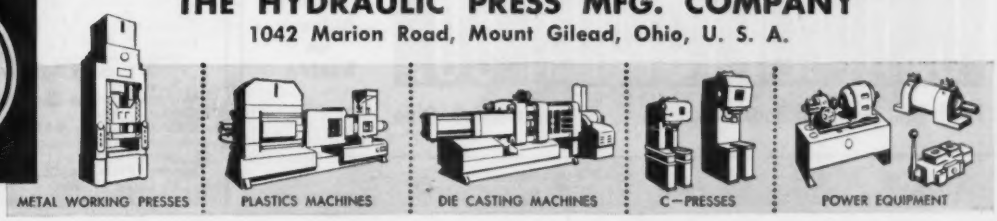

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Ingersoll-Rand Co., Phillipsburg, N. J.

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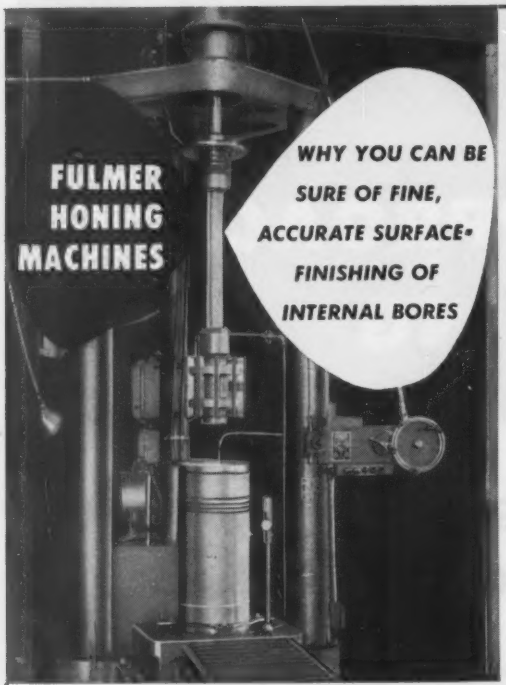
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.



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Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
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Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
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(*Continued on page* 354)

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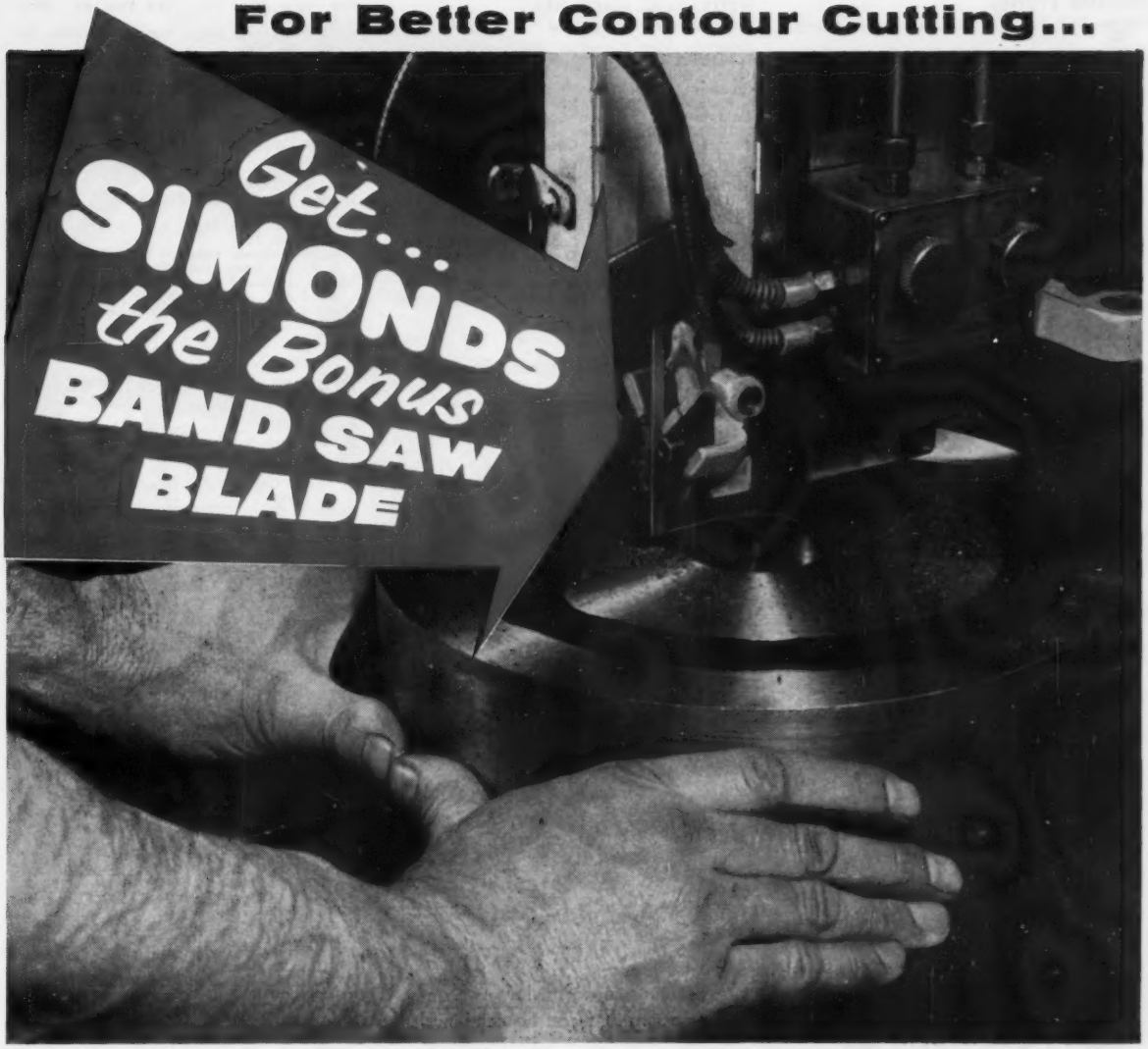

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Barnes, John S., Corp., Rockford, Ill.
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Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
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Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
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Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
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Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
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Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

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Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
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Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

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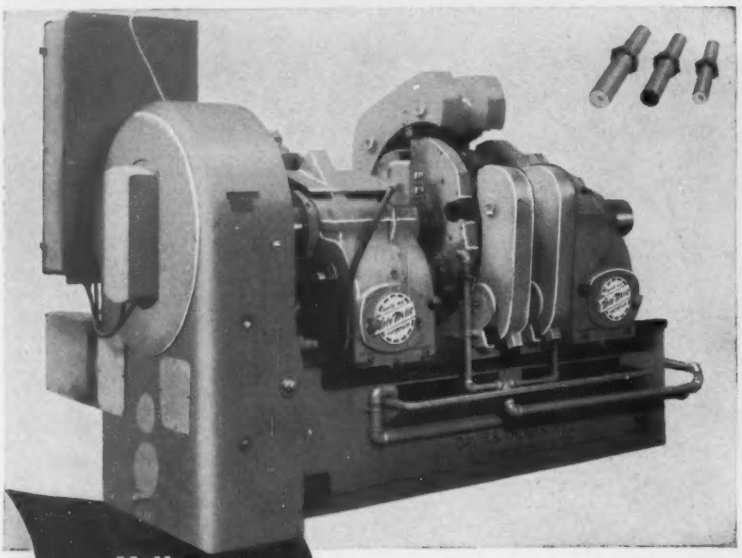

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Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 16, WISCONSIN

For more information on products advertised, use Inquiry Card, page 257

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Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.

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Enterprise Mch. Parts Corp., Detroit, Mich.

JACKS, Planer
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Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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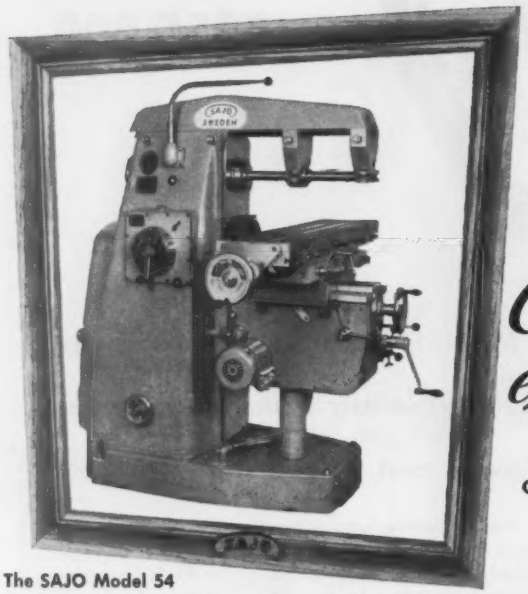
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

LATHE AND GRINDING DOGS
Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
Knapp, B. L., Ind., 107 N. Franklin Ave., Syracuse 4, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.

(*Continued on page 360*)



Classic example

OF SWEDISH CRAFTSMANSHIP

The SAJO Model 54
No. 2 ALL-GEARED Milling, Machine Plain or Universal

is an outstanding example of Swedish craftsmanship and fine quality materials, combined in a modern design.

Capable of continuous dependable service under the most severe conditions and guaranteeing maintenance of accuracy to tenths, the SAJO Model 54 Millers meet all requirements for:

POWER..... 7½ HP motor drive to spindle (5 HP optional).
1½ HP table feed and rapid traverse motor.

RANGE..... 16 spindle speeds 39-1500 RPM (optional 31-1200 RPM).
12 table feeds 11/16" to 25"/min. longitudinal and cross.
11/32" to 12½"/min. vertical.
Power rapid traverse 96"/min. longitudinal and cross. 48"/min. vertical.
Table travel longitudinal 33½". Cross 10". Vertical 18".

ACCURACY .... Handscraped sliding surfaces, Spindle (#50 NMT taper) mounted in four precision SKF bearings ensuring constant smooth operation and fine finish.

SIMPLICITY ..... Single adjustable START-STOP-BRAKE lever, Dial selection of speeds and feeds.

Priced well below levels of comparable top grade millers.

Prompt delivery. Full selection of accessories available.

Also available: SAJO No. 2 Light Duty Plain or Universal Millers.

For information write to:

austin industrial corp.

76-E MAMARONECK AVE., WHITE PLAINS, N.Y.

Look for the Austin Seal—your full guarantee of satisfaction.

Dealers in principal cities

For more information on products advertised, use Inquiry Card, page 257

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at "CHICAGO" we DO something about it!

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● **From over 4,000 standard catalogued items *in stock* your shipment is on its way within 24 hours — often sooner.**

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That is why so many industrial users in the last 83 years have come to specify "Chicago" Screws . . . service is faster . . . quality is better . . . it costs less to do business with us because no large inventories are necessary.

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CHICAGO SCREWS

The CHICAGO SCREW COMPANY
ESTABLISHED 1872
3807 Washington Boulevard
Bellwood, Illinois

402

The complete Chicago "Safety Plus" line includes in alloy steel: Socket Set Screws • Socket Head Cap Screws • Socket Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Flat Head Socket Cap Screws • Dowel Pins • Hexagon Keys and Key Kits • Also Socket Set Screws and Socket Head Cap Screws in Stainless. The complete "Chicago" line of Standard Products includes: Hexagon Head Cap Screws in steel—bright and Grade 5, heat treated, also in brass and stainless • Square Head and Headless Set Screws • Taper Pins • Steel Studs Flat and Fillister Head Steel Cap Screws • Hexagon Nuts in steel, brass and stainless.

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It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

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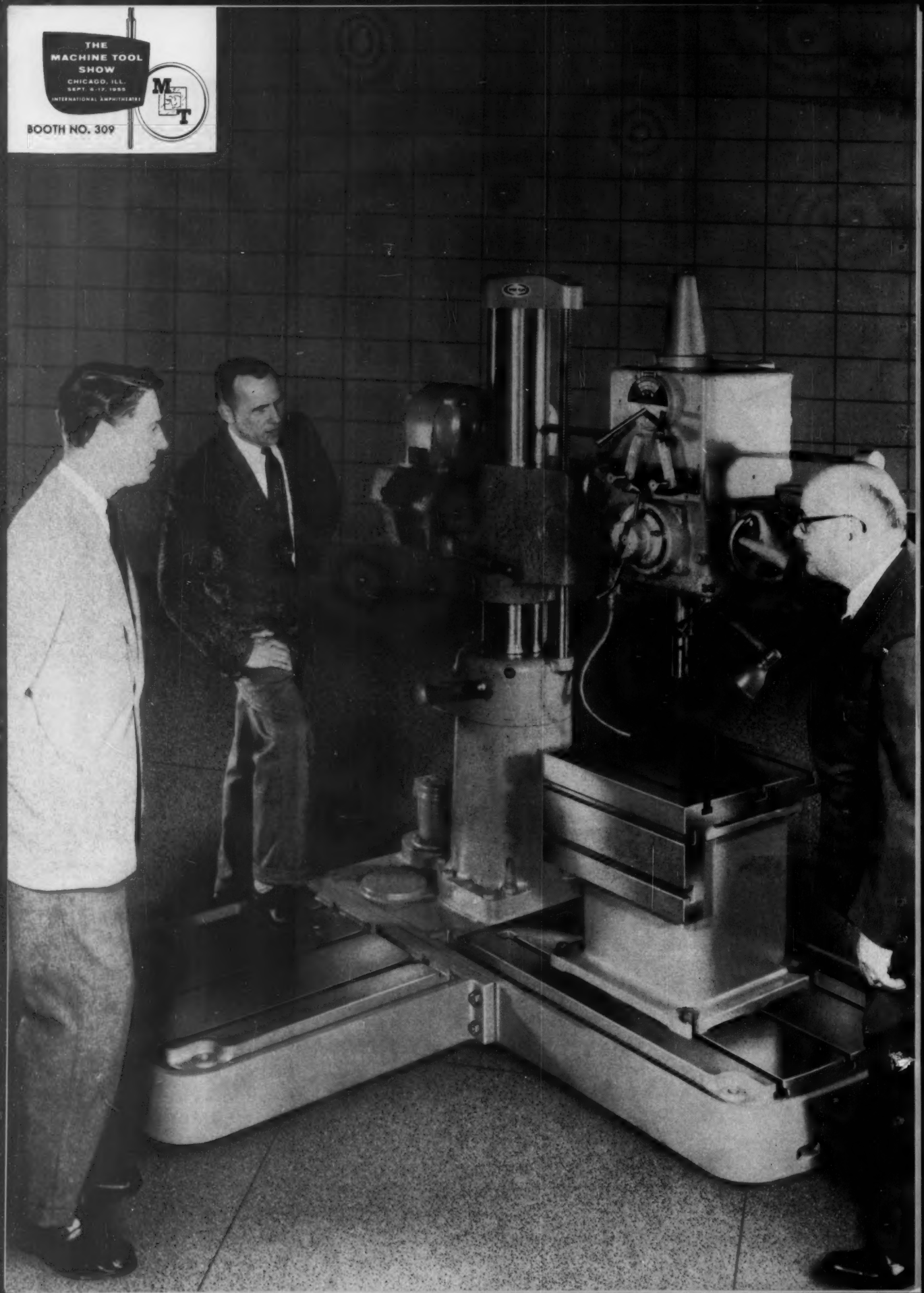
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS


THE
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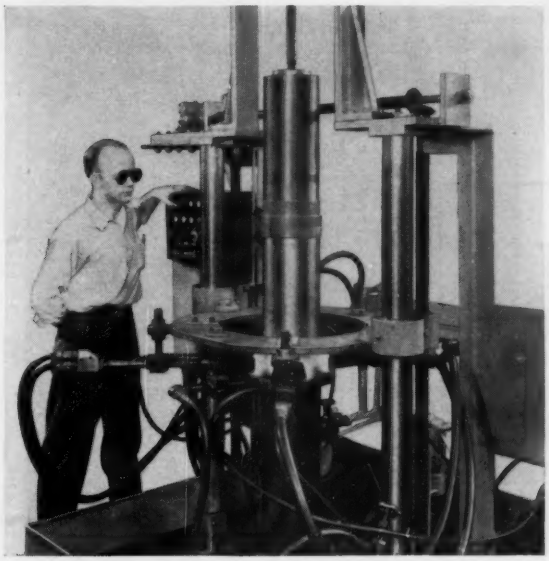
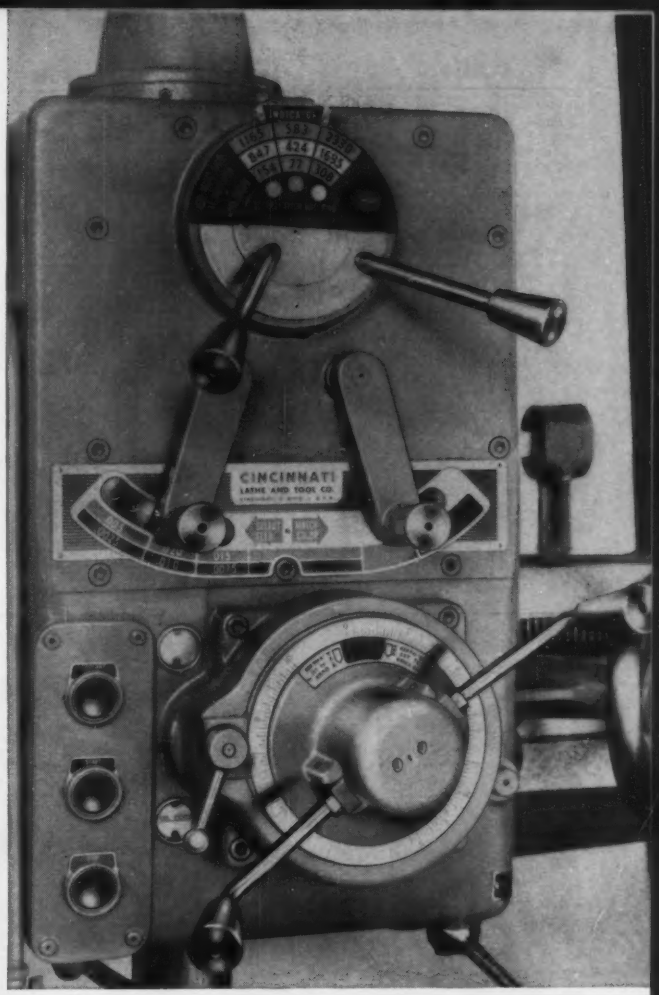
SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE
BOOTH NO. 309

Easy to operate. Controls for 9 spindle speeds, 6 power feeds grouped conveniently for the operator. Simple color-matched speed and feed selection dials. No. 3 Morse taper spindle; 1½″ capacity in cast iron. Unit construction throughout; hardened steel gears; forced-spray lubrication.

Flame-hardened column. 7½″ FLAMATIC hardened column provides a rigid cylindrical way for the 3′ arm. Column is mounted on heavy-duty, antifriction roller bearings in a sturdy column support. Waffle-ribbed base of adequate floor area and weight to provide stability.





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FIRST WITH A HARD CLAD COLUMN

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Engineered—to provide a thick-walled, centrifugal casting of close-grained iron; accurately turned on modern, high-speed lathes; surface hardened; then ground to close tolerances and a mirror-like finish.

Tested—by subjecting the new column to years of round-the-clock operation.

Approved—by the men who know machine tools best—the users.

Priced—attractively for contract and job shops, toolroom and maintenance use, and manufacturing plants.

Available—*now* from CL&TCO authorized machine tool dealers in all major centers. Write to Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio, for catalog D-133 and name of nearby dealer.

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Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Loage & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Automatic

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.

(*Continued on page* 362)

SHELDON
CHICAGO

Sheldon's larger, wider "Zero Inspection", Tapered Roller Spindle Bearings save you money by making these lathes better in 6 ways.

Write for G-55 catalog showing new 10" 11" and 13" swing, bench, cabinet and pedestal mounted Sheldon Precision lathes.

1st They *meet* Sheldon's high standard for accuracy—each bearing has a run out limited to .00015"

2nd They absorb thrust and radial loads beyond requirements—basic rating on front bearing at 500 R.P.M.
for radial loads.....3540 lbs.
thrust loads.....2335 lbs.

3rd They *end* costly bearing maintenance—require only a fractional turn of bearing take-up after long periods of service.

4th They *hold* the spindle in rigid alignment while permitting it to turn freely at high or low speeds—the line contact between rolls and races, and the opposing taper design, preclude lateral movement or end play.

5th They *minimize* friction—smooth mirror finished rollers and races running in light oil, deliver more horsepower at the Spindle Nose and lower power costs.

6th They *increase* work capacity. Larger than similar type bearings on other lathes in this price range, these bearings make it possible to turn out *more work* and *better* work at lower costs.

SHELDON MACHINE CO., INC.
4246 NORTH KNOX AVE. • CHICAGO 41, ILLINOIS

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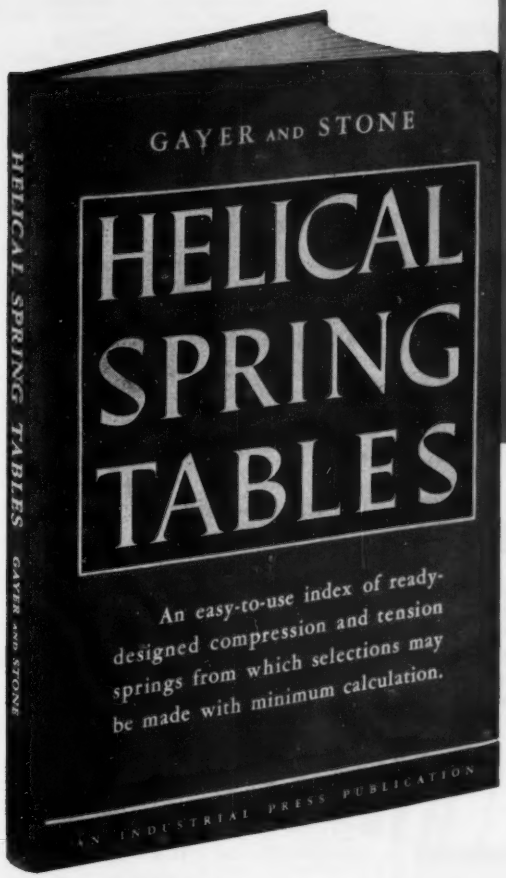
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M/4-55

***This information would be appreciated for our records**

For more information on products advertised, use Inquiry Card, page 257

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

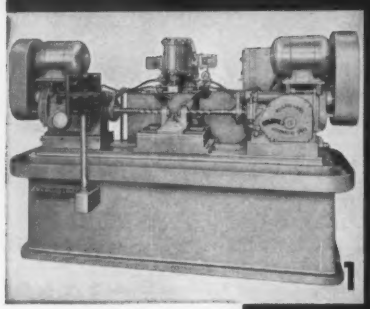
LATHES, Gap

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

MILLHOLLAND



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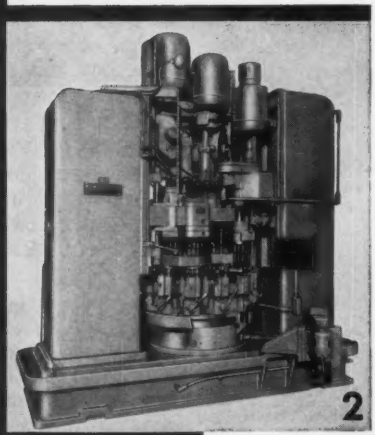
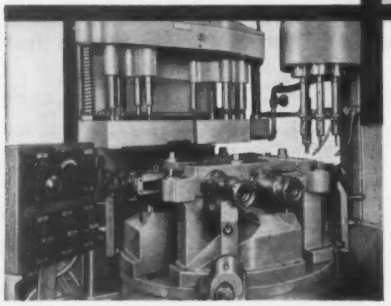
— for your special jobs

Millholland design gives you standard machine flexibility and economy . . . special purpose efficiency . . . and toolroom accuracy. The unique plate type cam, with pneumatic counterbalance used in Millholland Automatic Units, keeps units removing metal 80% of total cycle time. Millholland designs and builds a wide range of machines and fixtures to solve your special production and tooling problems. Let us show you how we can help you combine, speed up and simplify any combination of rotary tool operations.





1. Many different parts are machined on this Double End Machine by changing fixtures, tools, V-belts and cams.

2. Millholland-designed fixtures enable this 12-station, 34-spindle vertical indexing machine to produce 93 pieces per hour.

3. Design features permit this 4-station vertical indexing machine to perform identical operations on two different steering gear housings without tooling changes.

Write for More Information on These Machines in Bulletin 116-M

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Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Springfield Machine Tool Co., Springfield, Ohio.

LATHES, Hollow Spindle

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom

LATHES, Turret

Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

(*Continued on page 364*)

For more information on products advertised, use Inquiry Card, page 257

approved by U. S. industry • meet government specifications
approved by world-wide industry

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meet or exceed ASTE standards • ideal for production
approved at sea • used by U. S. Navy and merchant marine
approved for jet engine program

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used in atomic energy projects
excellent for maintenance

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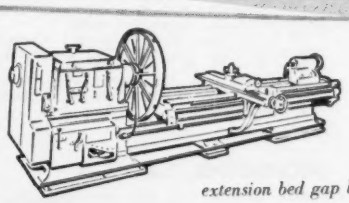
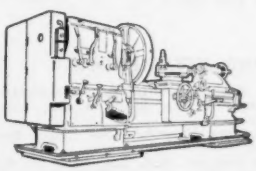
BY U.S. INDUSTRY

NOW READY FOR ANY CHALLENGE!

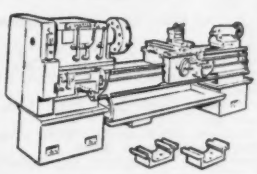
Nebel lathes are approved by every important industry, and for almost every government project. Continuously improved since 1889, they're ready for *your* assignment. Write for bulletin. The Nebel Machine Tool Co., Cincinnati 25, Ohio.



extension bed gap lathes



engine lathes



removable block gap lathes

Nebel
LATHES

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workhorse of the metal working shop since 1889

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

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Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
White & Bagley Co., Worcester, Mass.

LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

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See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

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du Mont Corp., Greenfield, Mass.

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HORIZONTAL BORING MACHINES
VERTICAL BORING MILLS
PLANERS

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here are the most modern machine tools on the market today, incorporating the finest in engineering principles and the most advanced techniques.

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3", 3½", 4", 5", 6" SPINDLES.
45 SPEEDS — 36 MILLING FEEDS
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Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Max Wyler, 611 W. 43rd St., New York 36, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.,

METAL FINISHINGS

Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

METERS

See Recording Instruments

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co. Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

(*Continued on page* 366)

For more information on products advertised, use Inquiry Card, page 257

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Threadwell

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FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.

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Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Milholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc., (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.

MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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As specialists in the thread and form rolling field for more than 35 years Reed has worked closely with designers and producers of formed and threaded parts. The experience gained from this close association enables us to offer a more complete thread rolling service to help you with your thread rolling problems and assist in developing threading applications.

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Let Reed Research and Experience Help You
The Aircraft Industry selects the THREAD ROLLING PROCESS . . .
Every Thread Precision Farmed . . . to Specifications
1. 542,600 served by roll threading with Reed Attachment
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THREAD ROLLING MACHINES AND DIES, THREAD ROLLING ATTACHMENTS, THREAD ROLLS AND KNURLS FOR AUTOMATIC SCREW MACHINES AND TURRET LATHES

SALES OFFICES IN PRINCIPAL CITIES

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501

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co. 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page 370*)

Tips from Taft-Peirce

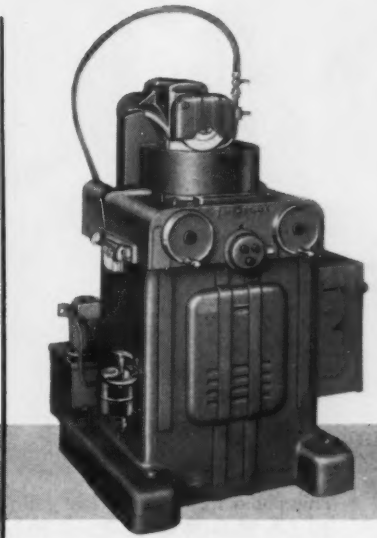
on how to...

Grind to .0001″

Hard to believe but true. This Taft-Peirce No. 1 Surface Grinder, with verniers, produces surfaces of an accuracy, flatness, and finish formerly considered difficult or impossible to achieve. Experienced operators frequently can grind to .00005″, with surfaces so smooth, in many cases, they seal without lapping.

Lower Lapping Costs

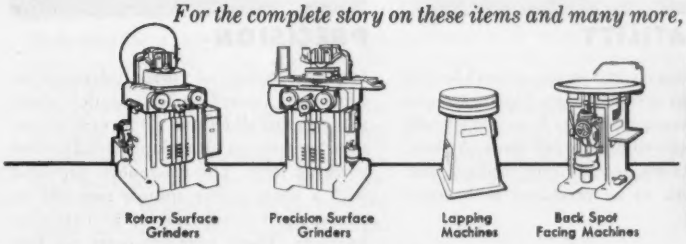
A T-P 24″ Rotary Lapping Machine offers a fast, accurate way to obtain superfine finishes and true contact surfaces. Low in original cost, economical to operate, it has the speed and capacity for rapid processing in small lot manufacture or tool room work. Available with plain plate for cylindrical work, grooved plate for flat work.



Reduce Grinding Time

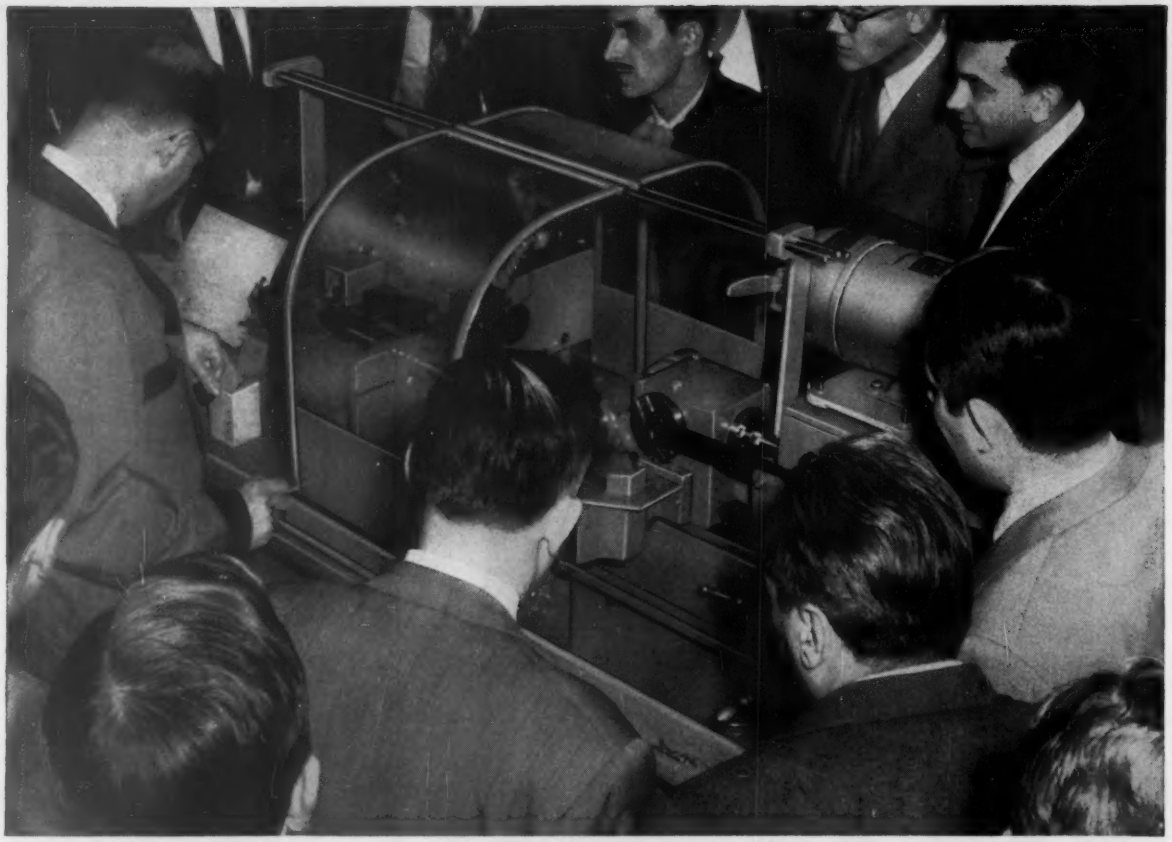
Developed for our own shop, T-P 6″ Rotary Grinders make fussy precision work easier and faster than ever before. Tilting Wheelhead tips 30 degrees below center . . . locks accurately in any position. Superpower magnetic chuck turns through 15 degree angle. Vernier feed permits .0001″ vertical settings.

For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.



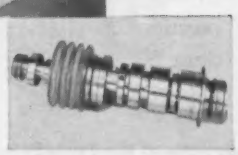
T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY · WOONSOCKET, RHODE ISLAND



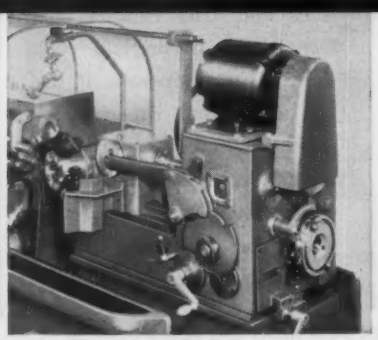
This photo was taken in late February in Chicago at the first showing of the Detroit Screwmatic 750—the greatest real advancement in single spindle screw machine design and performance in 20 years. Put yourself in this picture at *your* dealers . . . and you, too, will see a demonstration of lowered costs and increased production.

Just 6 of the Detroit ScrewMatic features that



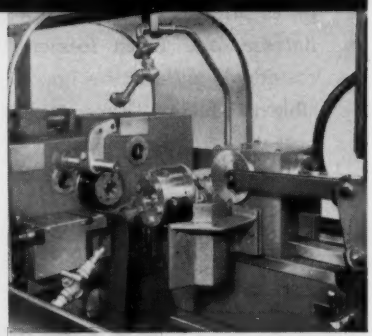
HIGH PRODUCTION

Screwmatic's heavy-duty, five horsepower motor and advanced spindle design permit speeds sufficient to machine all types of materials with carbide tools. Spindle speeds are infinitely variable and three different forward speeds may be employed during any cycle of work. All speeds are reversible, thereby eliminating need for left-hand tools.



VERSATILITY

Slideable turret unit increases work length capacity by several inches. The turret unit may be positioned away from the spindle without crowding toward tools. A three position crank permits long, medium, and short work to be produced with equal efficiency.



PRECISION

Staying accuracy of closest tolerances in forming is assured by Screwmatic's heavy section cross slides and direct cam activation. Six position turret is provided for end working tools. The machine is provided with a short stubby spindle mounted in precision non-adjustable, anti-friction bearings. These bearings carry no belt load.

IF YOU HAVEN'T BEEN IN A GROUP LIKE THIS...

you don't have the last word on the latest in screw machine performance

Single Spindle . . . High Speed

Takes .750" O.D. Bar Stock

Heavy-duty Capacity

DETROIT Screwmatic 750

SEE IT DEMONSTRATED NOW AT YOUR DEALER'S

Send for more information. Write for name of nearest dealer.

A product of **THE GEAR GRINDING MACHINE COMPANY**

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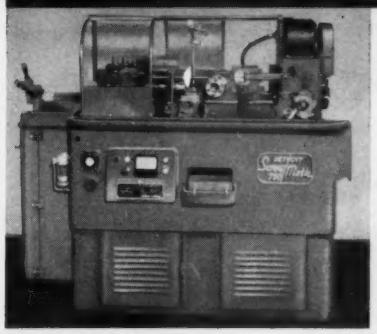
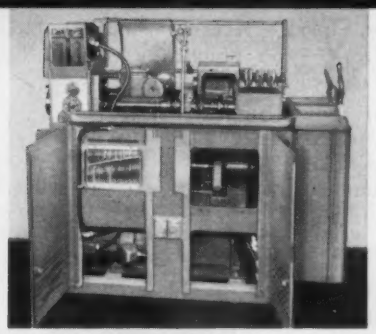
will increase your profits . . . decrease your costs



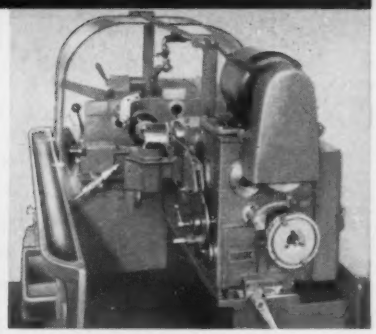
EASY SET UP

Retooling for a new job is quickly and easily accomplished. The fully visible, easily accessible lead cam does not require "cut downs" in normal operation. Tool and cam layout computations are greatly simplified by the Screwmatic's open front, high wall cabinet, immediate tool accessibility, and large tooling space. Standard tools, cams, and collets are used throughout the machine.



ACCESSIBILITY

Open back view of the Detroit Screwmatic 750 shows the quick accessibility of cycle time gearing. At the right hand side of the photograph you can see the automatic lubrication and coolant pump drive. Above is the platform which allows attachments to be easily mounted.



LESS DOWN TIME

Down time to clean chip well is eliminated. Work chips flow into a large, deep chip well with an open end. This provision permits chips to be removed from the machine during actual operation. The high wall design provides oil splash protection for the operator. (Note handy parts receiver.) The overload safety throwout is immediately accessible at the end of unit.

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

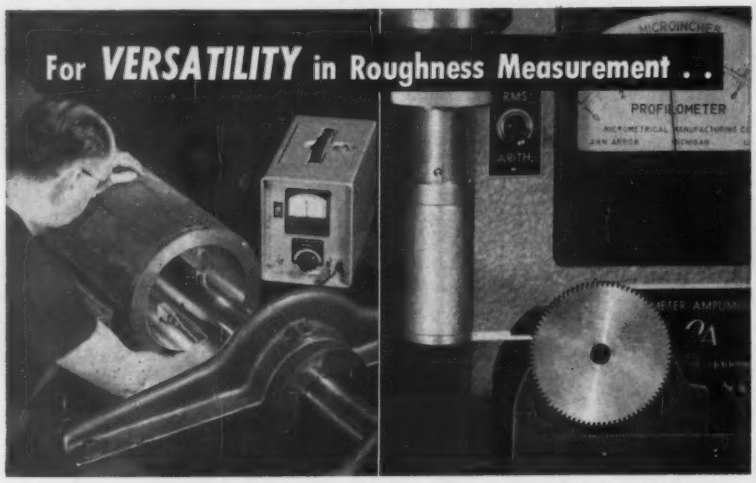
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

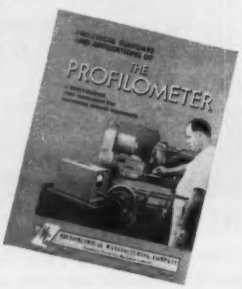
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch., Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27, Ohio.



The PROFILOMETER®

With the Profilometer, you can quickly measure the microinch roughness of ID's of *any* size from 5/64" to flat — OD's of *any* size from 1/32" to flat, and from .010" to *several feet* in length — gear teeth as small as 48 D. P. — internal grooves and tapers — recessed shoulders — ½" holes to 24" depth — and practically *all other* surfaces, including surfaces of rotation.

The Profilometer is a shop tool — rugged, portable, and simple to use. Highly stable and factory-calibrated for dependability. Used world-wide, in thousands of production and inspection departments . . . since 1936.



FREE BULLETIN LT89 gives details — shows typical applications — tells 7 ways in which *you* may gain through surface roughness measurement. Write!

Profilometer is a registered trade mark.

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MICROMETRICAL MANUFACTURING COMPANY
329 S. MAIN ST. ANN ARBOR, MICHIGAN

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools

MOLD AND DIE COPYING MACHINES

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

MOLYBDENUM

Climax Molybdenum Co., New York, N. Y.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

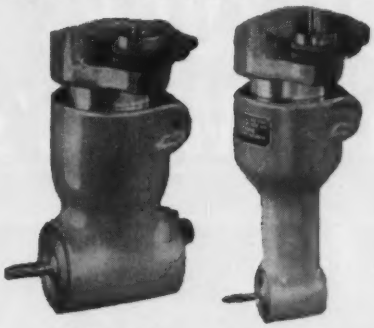
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

(*Continued on page 374*)

RIGHT ANGLE ATTACHMENTS

CHERRYING ATTACHMENT

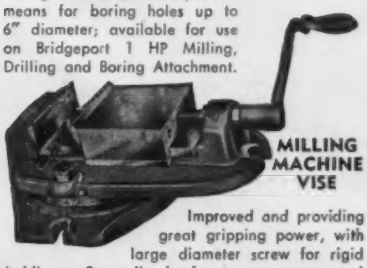
Makes possible production of convex and concave shapes. Ideal for producing drop forge dies, molds, cavities, metal core boxes etc.



(Left) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads (Right) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.

No. 2 BORING HEAD

Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



MILLING MACHINE VISE

Improved and providing great gripping power, with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5"x3½" and 6"x5" jaw openings.

A few of the Attachments available

Bridgeport

offers great versatility through its wide range of ATTACHMENTS

"Bridgeport Millers" in themselves are universally recognized as machines of outstanding utility. Their *exclusive method* of being able to drill, mill, bore and shape over a wide area without changing set up, has contributed much to their universal acceptance through the convenience, economy and accuracy offered. But this is not the whole story . . .

Note the attachments shown above. Here are a few means developed by "Bridgeport" engineers to go still further in extending the versatility of these machines . . . attachments which mean not only greater convenience but which vastly extend the operations which can be performed . . . attachments which will enable *one* machine to do the work of *several* single purpose machines. Furthermore, many more jobs can be assigned to the "Bridgeport" with the result that many more productive hours are available from *one* machine.

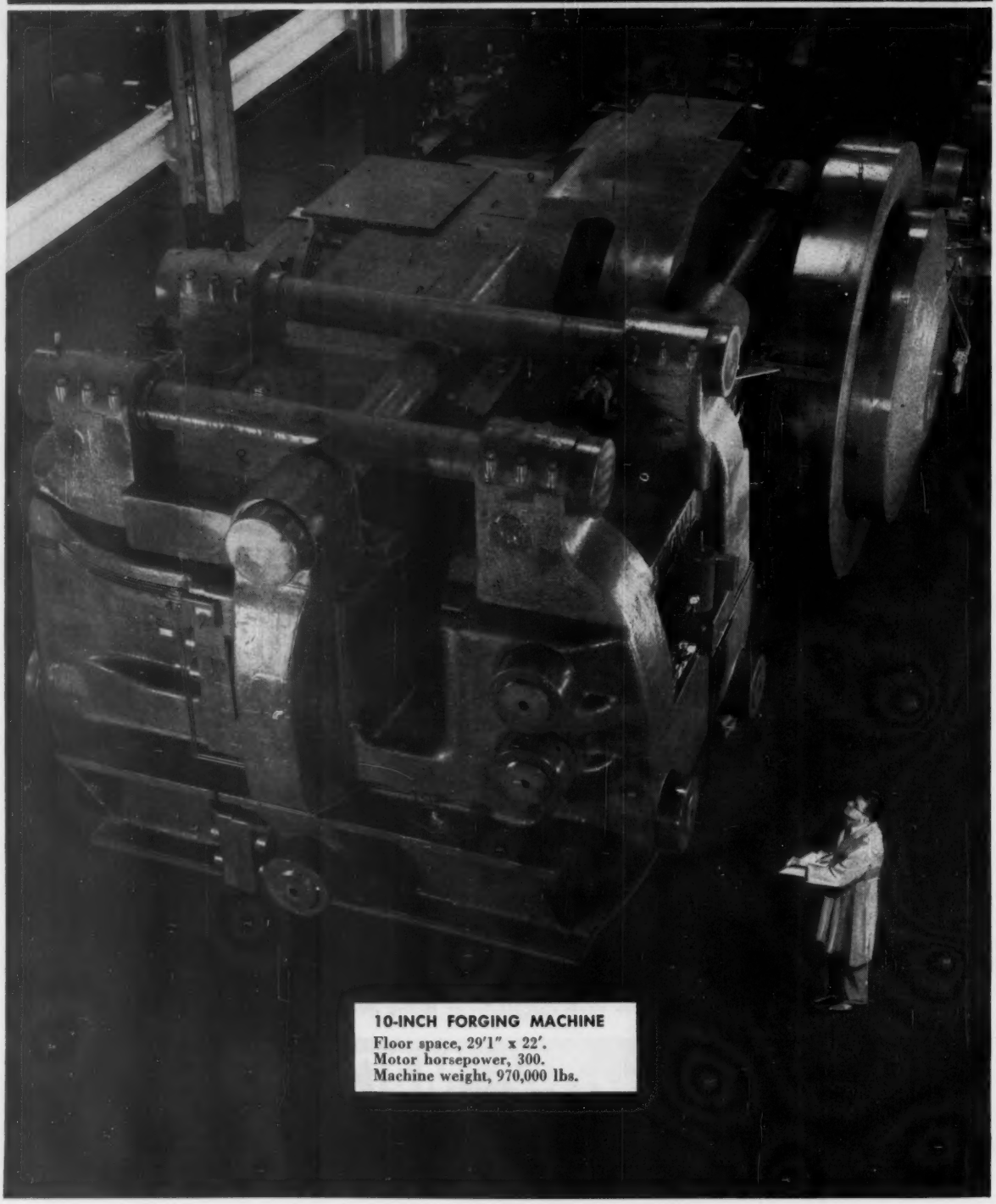
Ask your dealer . . . or us . . . to show how you, too, can apply Bridgeport Attachments to extend the utility of your machines. Ask also for literature on Bridgeport Turret Milling Machines.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

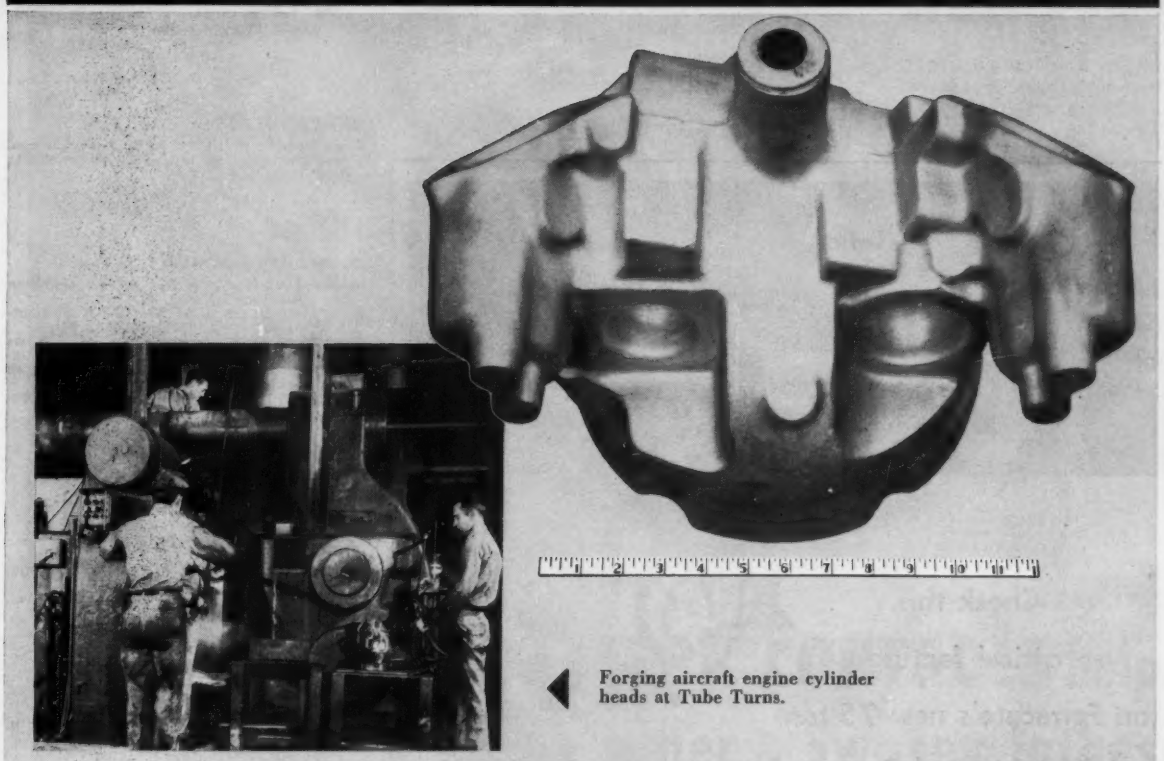
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

TUBE TURNS INSTALLS the World's Largest



10-INCH FORGING MACHINE
Floor space, 29'1" x 22'.
Motor horsepower, 300.
Machine weight, 970,000 lbs.

A 10-INCH NATIONAL . . . Horizontal Forging Machine!



Forging aircraft engine cylinder heads at Tube Turns.

Tube Turns of Louisville, Ky., relies upon a 10-inch National — the largest horizontal forging machine in the world — to produce efficiently the 72-pound aluminum aircraft engine cylinder head forging illustrated above.

The progressive Tube Turns organization — a division of National Cylinder Gas Company — has long been recognized for its leadership in producing important commercial and aircraft forgings. The installation of the 10-inch Forging Machine is another step in the company's progress.

This is another example of teamwork between forward-looking industry and National Machinery to develop advanced forging methods. To help you "flow metal," our years of experience are available to apply to your forging job, be it routine or unusual, hot or cold, ferrous or non-ferrous, automatic or semi-automatic.

We would be pleased to welcome you at our plant — "World Headquarters for Forging Engineering" — where tomorrow's new and better ways of producing metal parts are already being tested today!

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

OIL EXTRACTORS AND CLEANERS
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS
Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

OIL SEALS
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS
Madison-Kipp Corp., Madison, Wis.

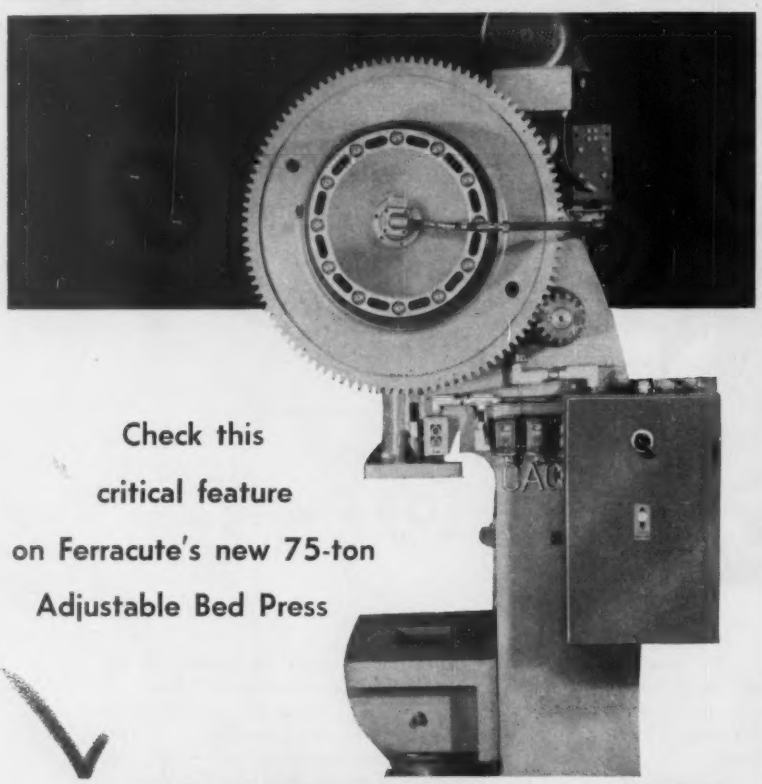
OILS, Cutting
See Cutting and Grinding Fluids.

OILS, Lubricating
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble
See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.



Check this critical feature on Ferracute's new 75-ton Adjustable Bed Press

AIR OPERATED FRICTION CLUTCH

Guards removed to show air-operated electrically controlled friction clutch. New *interconnected* single-point adjustable brake mounted on reverse side of gear. Designed originally for one of the largest automotive manufacturers in the country, this press will have wide application in many industries. Highly versatile in punching, forming, blanking. 11" adjustable bed. J.I.C.Nema 12 control panel.

FERRACUTE
Since 1863

Write for Complete Specifications

MACHINE COMPANY
Bridgeton, New Jersey, U.S.A.

Manufacturers of Power Presses, Press Brakes and Special Machinery

ORDNANCE MACHINES, Spelial
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.

PAINTING EQUIPMENT, Spray
Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

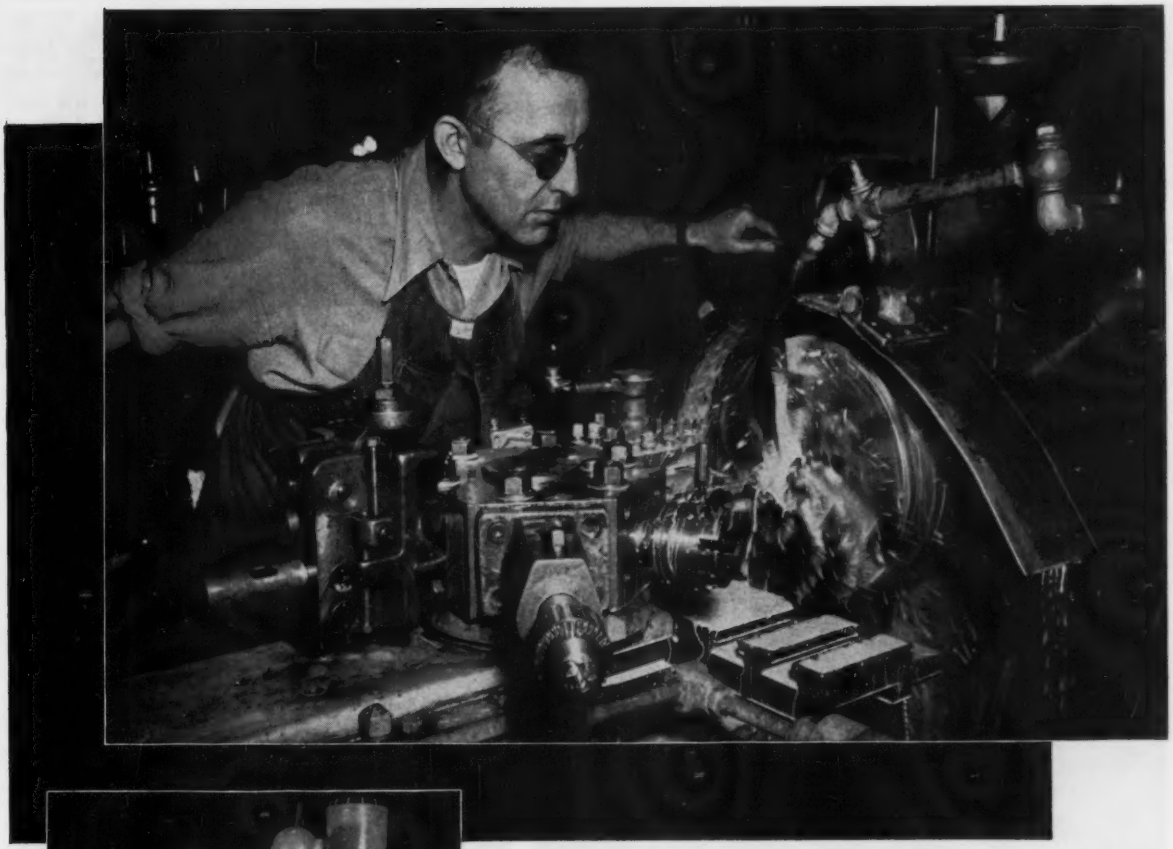
PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

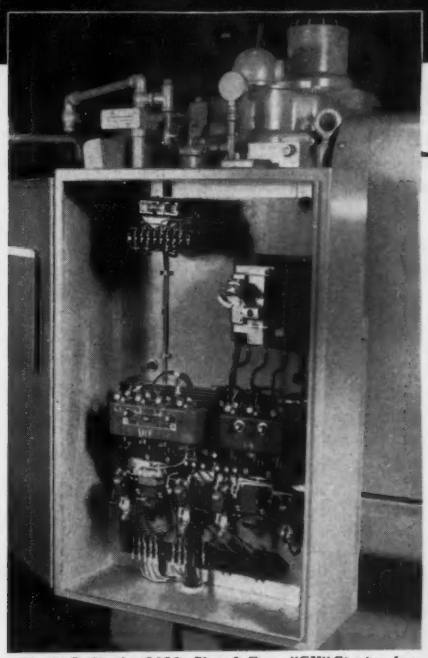
PATTERNS, Wood and Metal
Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

(*Continued on page* 376)





Clark Bulletin 6050, Size 2 Type "CY" Starter for Single Winding 2 Speed Constant Torque A.C. Motor used on Warner & Swasey Universal Turret Lathes.

→ CLARK CONTROLS help Warner & Swasey lathes

"machine better, faster, for less"

● Selected for long, trouble-free performance, Clark Bulletin 6050 Size 2, Type "CY" 2-speed starters are used on Warner & Swasey's No. 5 Universal Turret Lathes. Maintenance and wear on contact tips are reduced to a minimum as a result of an exclusive arc quenching method employed on Type "CY" starters. Effective arc interruption and reduced wear on tips is accomplished by using strong multi-turn magnetic blowouts and double-break contacts. Forced rotation continuously moves the arc from a hot to a cold spot, distributing the heat evenly over entire contact, preventing pitting or "build-up." Tips require no cleaning or dressing over long years of maintenance-free operation.

Write for complete descriptive literature.

The **CLARK** **CONTROLLER** *Company*

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

PIPE, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

PLANERS

Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.

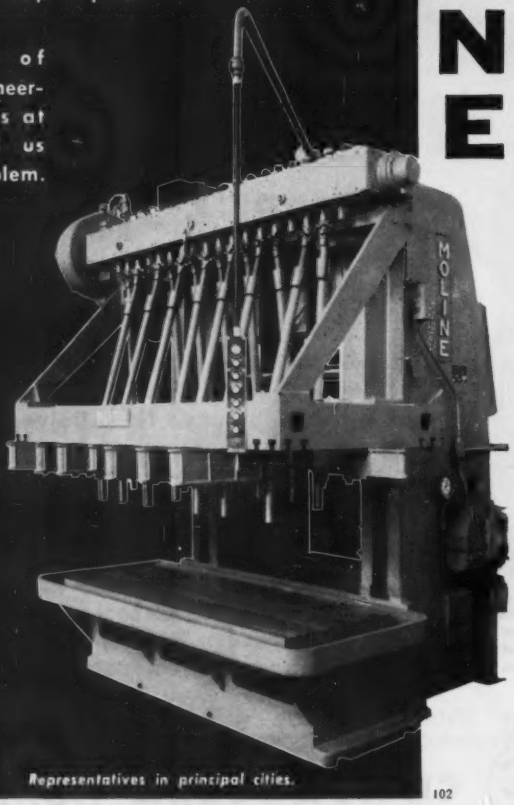
FOR GREATER . . .
PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

MOLINE

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.



HU68 drilling machine with fourteen spindles adjustable in a 72 inch by 24 inch drilling area. Other sizes available.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

Representatives in principal cities.

102

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tools Heads

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.

(*Continued on page* 378)

For more information on products advertised, use Inquiry Card, page 257

The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in hidden tooling costs

THE difference between your costs and your competitors' may be hidden behind the production line. It's the cost of maintaining your tooling.

There's time lost for tool sharpening! Extra floor space for extra machines in the tool room! Skilled tool dressers! Chuck alignment and maintenance! Production lost for wheel dressing!

One answer to hidden tooling costs is Microhoning

Instead of bits to be sharpened and wheels to be dressed Microhoning uses self-aligning, self-dressing tools. Throughout their life Microhone abrasives make clean, uniform cuts.

Look behind the production line and you'll find that your hidden tooling expense may total more than the cost of the latest type of Microhoning equipment, which would assure you of increased output, uniform quality, consistent accuracy of dimension and a functional surface finish. In short, you are paying right now for the new machine tools you don't have.

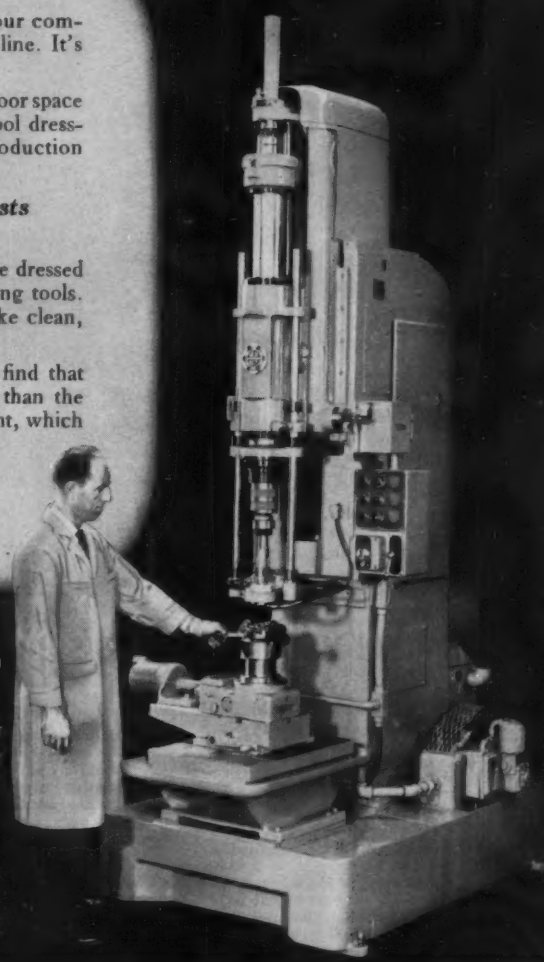
Surface: Spline in gear
Condition: Distorted by heat-treating

PROBLEM:

Excessive tooling cost—frequent changing and sharpening of tools—annealing of surface required—poor surface finish.

SOLUTION:

MICROHONING—Tool self sharpening—annealing not necessary—clean, consistent surface finish generated.



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MICROMATIC HONE CORP.
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MICROMATIC HONE LTD.
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MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
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MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon
Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Perine Machinery & Supply Co., 1921 First Ave. South, Seattle 4, Washington
REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

MICRO-PRECISION DIVISION
2205 Lee Street, Evanston, Illinois
Hydraulic controls
Diesel fuel injection equipment

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.

PRESSES, Extrusion

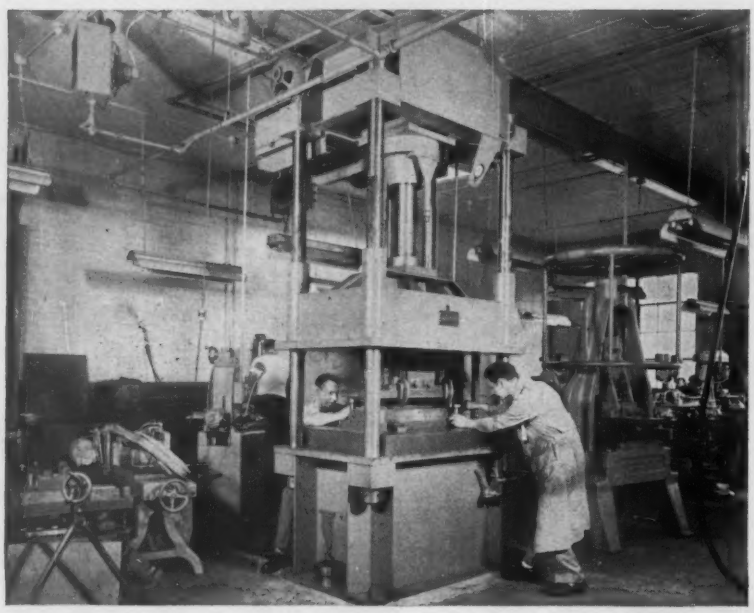
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
National Mchry. Co., Greenfield and Stanton Sts. Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.



The diemaker who made a nuisance of himself

This is the story of Three Star Manufacturing Co.—a custom diemaker who serves a number of manufacturing plants in Chicago.

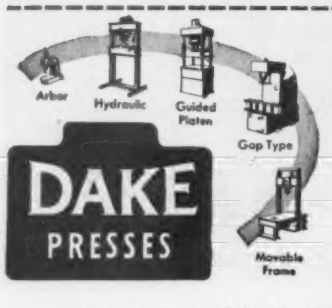
As in most such shops, his only means of trying out dies was a hand power screw press which sometimes needed six or seven men to get the needed pressure.

Large dies had to be tried out on his customers' production presses . . . which required drayage ($15 to $20 each way) and interruption of his customers' production. It meant both expense and nuisance to his customers and himself every time a die had to be tested.

Now he has ended the nuisance by installing the press shown above in his own shop. It not only saves time and money, but avoids the embarrassment of having workers in his customers' plants see and know that occasionally a die must be taken back for adjustment.

Specifications for single-acting and double-acting die tryout presses in ten air-operated and sixteen electrically operated models are contained in Bulletin 267—sent gladly on request.

Dake Corporation, 604 Seventh St., Grand Haven, Mich.



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DAKE CORPORATION
604 Seventh St., Grand Haven, Mich.
Please send me a copy of Dake Catalog No. 129
Name_____
Company_____
Address_____
City_____ Zone____ State_____

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform) Cincinnati 9, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Mch. & Welder Co., Warren, Ohio
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

PRESSES, Screw

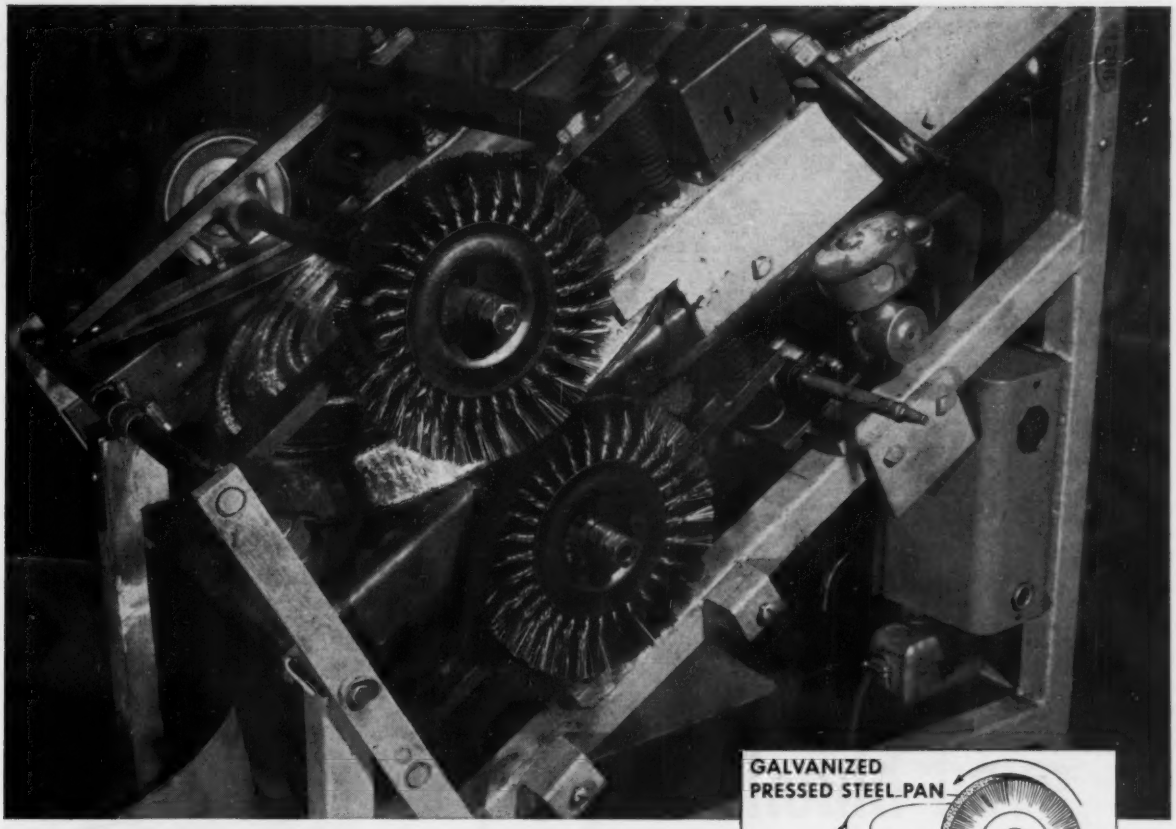
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

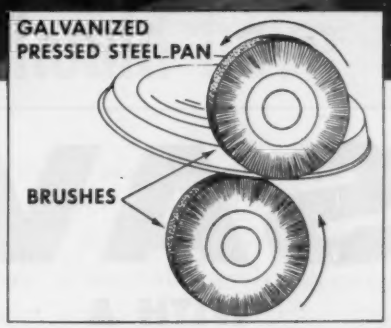
PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform) Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.

(Continued on page 380)

For more information on products advertised, use Inquiry Card, page 257





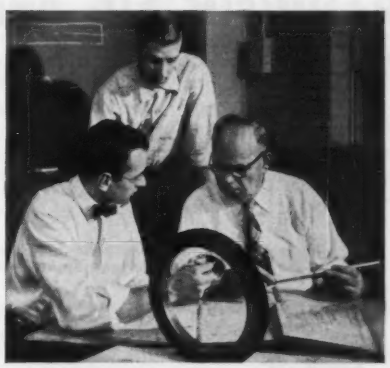
10-second brush-off removes excess coating

Let an OBA help solve your production problems

A touch of ingenuity and Osborn Power Brushing. That's all it takes to remove hard drips of zinc from these galvanized steel pans.

After pans are dipped for galvanizing, the operator merely drops them in place on this machine. Two Osborn Disc-Center® Brushes spin the pans, brush the spelter from the edges. In 10 seconds—all the time it takes for brushing, pans are ejected automatically.

Does this idea suggest an answer to a problem you have? An **O**sborn **B**rushing **A**nalysis can show you where power brushing will help speed production, improve product quality. Call or write *The Osborn Manufacturing Company, Dept. D-28, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



ENGINEERING HELP. *When an Osborn Brushing Specialist makes an* **OBA** *in your plant, he'll study your cleaning, finishing and burr removal operations . . . show where you can cut costs, boost product quality.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

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Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

PROFILING MACHINES

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
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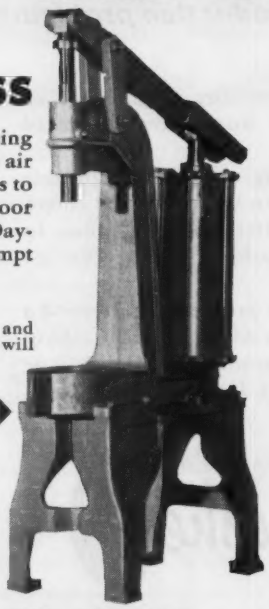

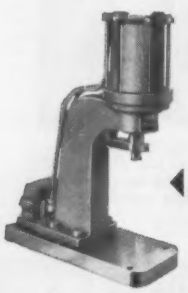

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PUNCHING MACHINERY

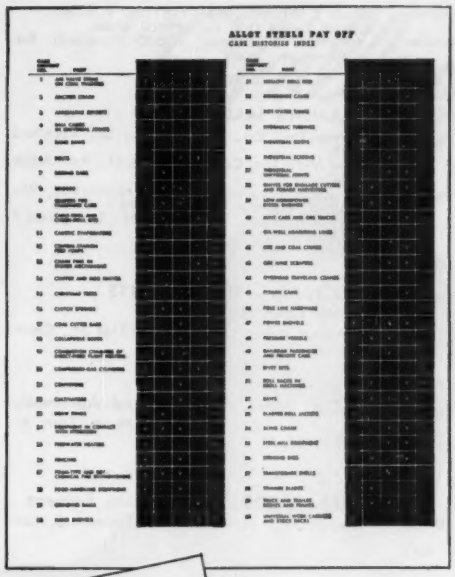
Allen, Alva F., Box 426, Clinton, Mo.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Engineering & Research Corp., Riverdale, Md.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wiedermann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

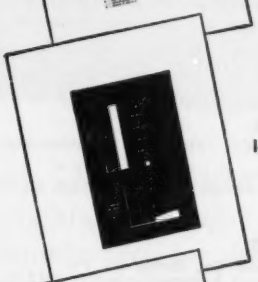
Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.

(*Continued on page 382*)

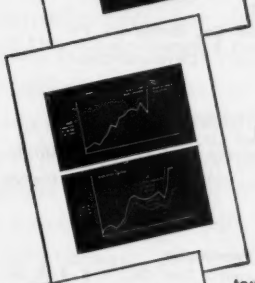
For more information on products advertised, use Inquiry Card, page 257



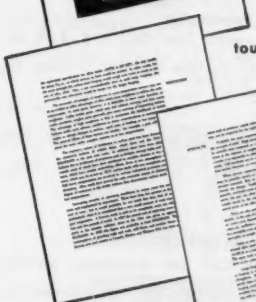
60 fully documented case histories



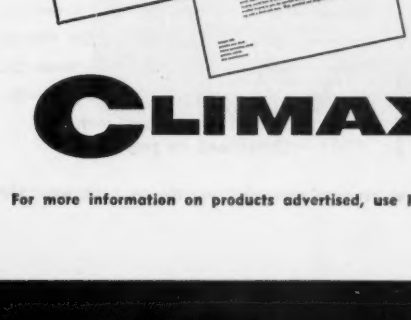
Facts on maximum pay load



Facts on lower operating costs



Facts on lower corrosion rate



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- greater pay load
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Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twists Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Kaufman Manufacturing Co., Manitowac, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

REELS, Stock, Standard and Automatic

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
Wood & Co., R. D., Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES

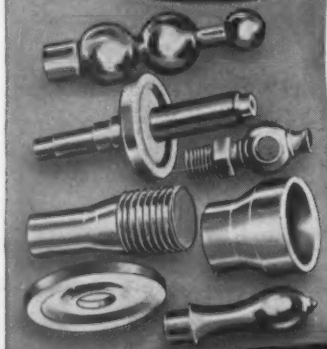
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

(*Continued on page* 384)

Lehigh
TRACER-TOOL
PROFILE-TRACING LATHE ATTACHMENT

Proven in 101 practical shop and production applications!

For Precision
DUPLICATING
With any LATHE, PLANER, BULLARD — with any type of tool



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LOW COST Heavy Duty Tool

Cuts duplicating time from hours to minutes. No complicated Hydraulic or Electronic controls. Requires no permanent lathe alterations. Uses easily made, low cost templates. Unlimited radii, threading, steps, facing, grinding, boring—on any metal. Models to fit lathes of all sizes.

Write for Catalog, Engineering Bulletins, and help on any Duplication Problem

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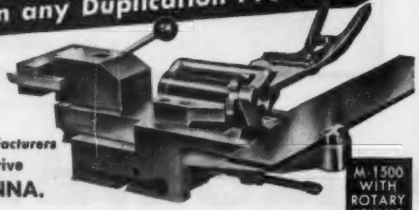

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RUBBER PRODUCTS
Garlock Packing Co., Palmyra, N. Y.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment

SANDERS
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Barnes, W. O. Co., Inc., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWING MACHINES, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob, Inc., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWS, Circular Metal Cutting
Barnes, W. O. Co., Inc., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SAWS, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

SAWS, Portable Electric
Millers Falls Co., Greenfield, Mass.

SAWS, Screw Slotting
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

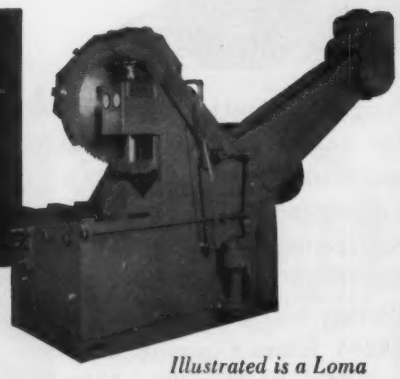
SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

SCREW DRIVING AND NUT SETTING EQUIPMENT
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

(*Continued on page* 386)

The PROOF IS IN THE PERFORMANCE OF RUTHMAN GUSHER coolant pumps



Illustrated is a Loma Hydraulic Billet Saw equipped with a Ruthman Gusher Coolant Pump.

Why do the leading manufacturers of metal cutting machinery use Gusher Pumps on their machinery? They've found Ruthman Gusher Pumps are dependable — give split second coolant flow from the moment the machine is turned on. And Gusher Pumps require a minimum of attention — they're pre-lubricated, need no priming or packing. Specify Gusher Coolant Pumps — Write us for catalog.

THE RUTHMAN MACHINERY CO.

1807 Reading Road Cincinnati, Ohio

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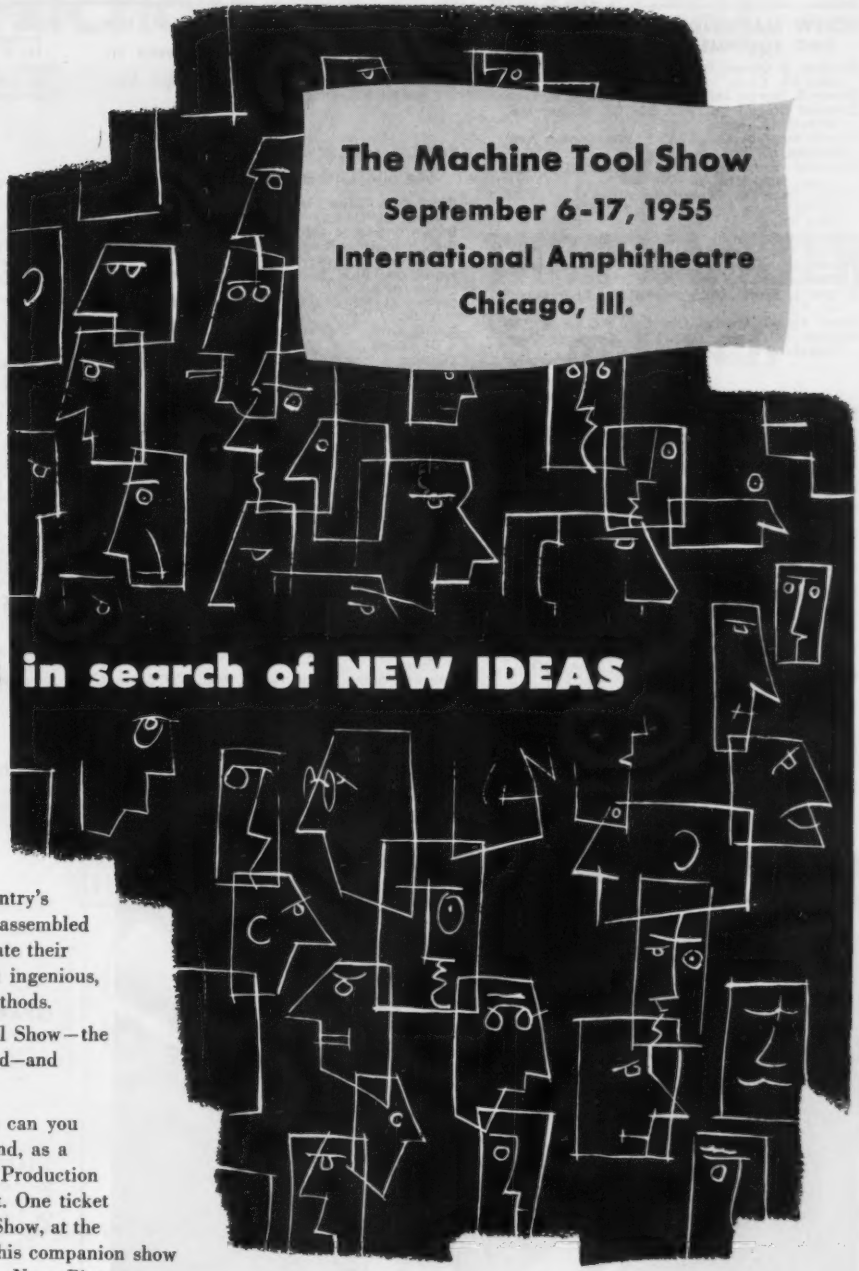

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September 6-17, 1955
International Amphitheatre
Chicago, Ill.

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SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P.O. Box 350,
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK

Eastern Mch. Screw Corp., New Haven, Conn.
Mueller Brass Co., Port Huron 35, Mich.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, M. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wisc.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co. Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
Chicago Screw Co., Bellwood, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New Cork, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-tapping, Drive

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co. Box 770, Saginaw, Mich.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(*Continued on page* 388)

STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

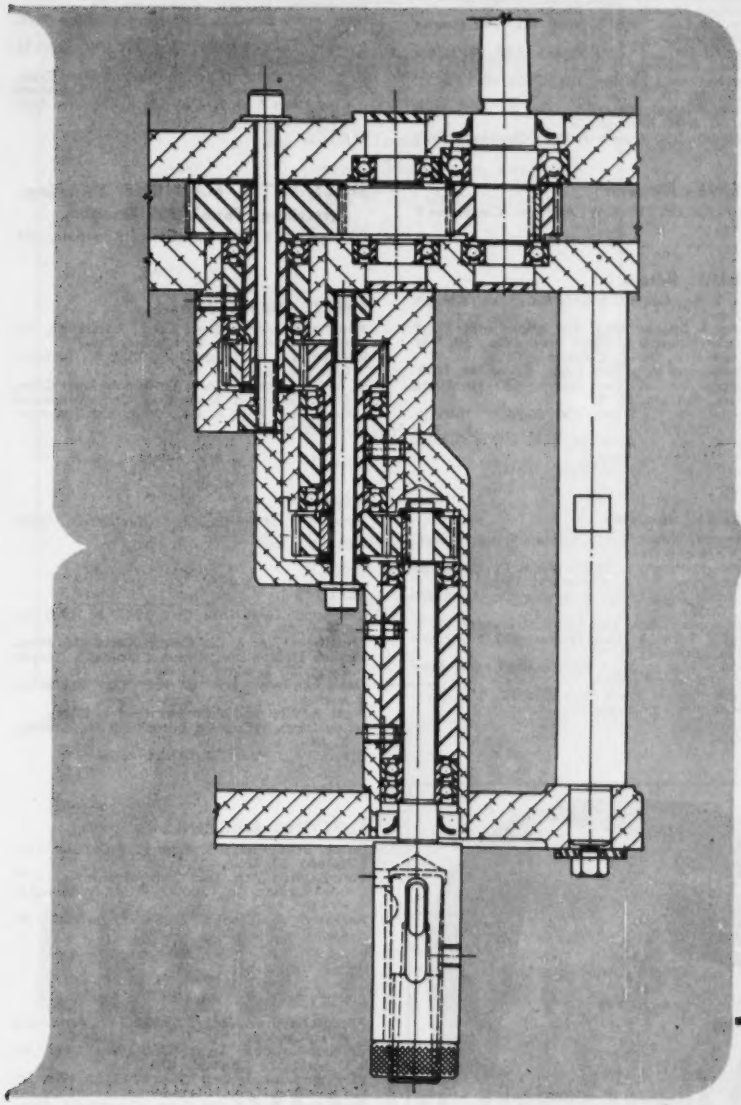
THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than $40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "SELECTING THE PROPER DIE HEAD FOR THE JOB" sent free on request.

THE EASTERN MACHINE SCREW CORPORATION 23-43 Barclay St., New Haven, Conn.

For more information on products advertised, use Inquiry Card, page 257

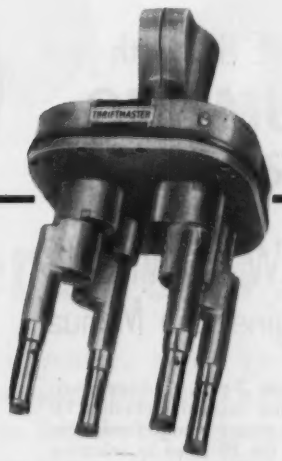
ANTI-FRICTION IS NOT ENOUGH!



Only THRIFTMASTER *has Full Ball Bearing Construction in a*

DOUBLE ECCENTRIC ADJUSTABLE DRILLHEAD

- Spindles can be set to drill irregularly spaced holes.
- Pre-loaded ball bearings on *all* rotating parts.
- All essential parts made of fully heat treated Chrome-Moly steel.
- Greater range of adjustment and small "dead or blind" area.
- No offset unsupported spindle thrust load.
- For drilling, tapping, boring or reaming.
- 20 standard models—3 to 8 spindles. Special models on order.



WRITE TODAY FOR THE COMPLETE STORY ON THIS DOUBLE ECCENTRIC ADJUSTABLE DRILLHEAD . . .

the latest addition to the Thriftmaster line of single eccentric, universal joint type adjustable and special fixed center drillheads.

THRIFTMASTER PRODUCTS CORPORATION

Subsidiary of Thomson Industries, Inc.

1014 N. PLUM STREET

LANCASTER, PENNA.

Also makers of DORMAN AUTOMATIC REVERSE TAPPERS

THRIFTMASTER

SHAPER-PLANERS
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS
American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, O.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Structural
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHEARS, Rotary
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

SHEET METALS
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
New Jersey Zinc Co., 160 Front St., New York, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEET METAL MACHINES, Shrinking, Stretching, Forming & Flanging.
Engineering & Research Corp., Riverdale, Md.

SHEETS, Iron and Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS
Laminated Shim Co., Inc., Glenbrook, Conn.

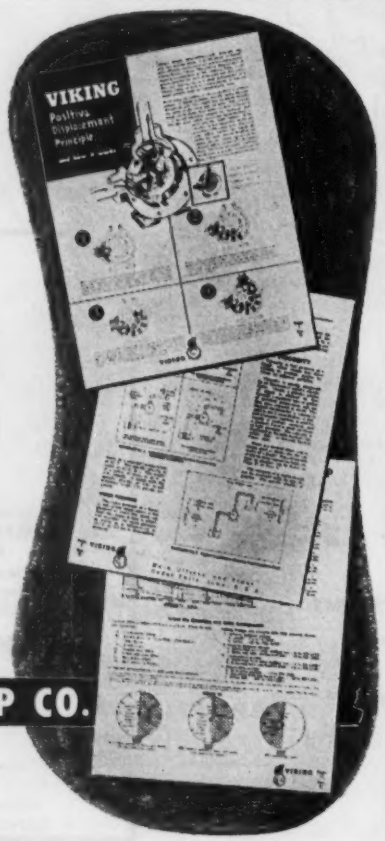
SLEEVES
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.

MORE HELP with your
PUMPING PROBLEMS

NEW 40 page VIKING Engineering Manual

A new 3-part, 40-page engineering manual including Viking rotary pump fundamentals, the 10 steps in selecting a Viking pump, and a special engineering section will help you in choosing the right rotary pump for your job.

This manual is free upon request. Write today for Manual Kj.



VIKING PUMP CO.
Cedar Falls, Iowa
See our catalog in SWEETS

SLOTTING MACHINES
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Wks. 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.

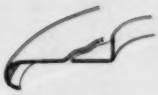
(Continued on page 390)

For more information on products advertised, use Inquiry Card, page 257

ERCO SHEET METAL FORMER AND FLANGER...

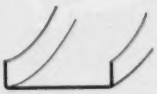
FLEXIBILITY that saves money...

1. ERCO forms External and Internal Flanges on irregular edges of flat sheet metal, circular discs or rings.

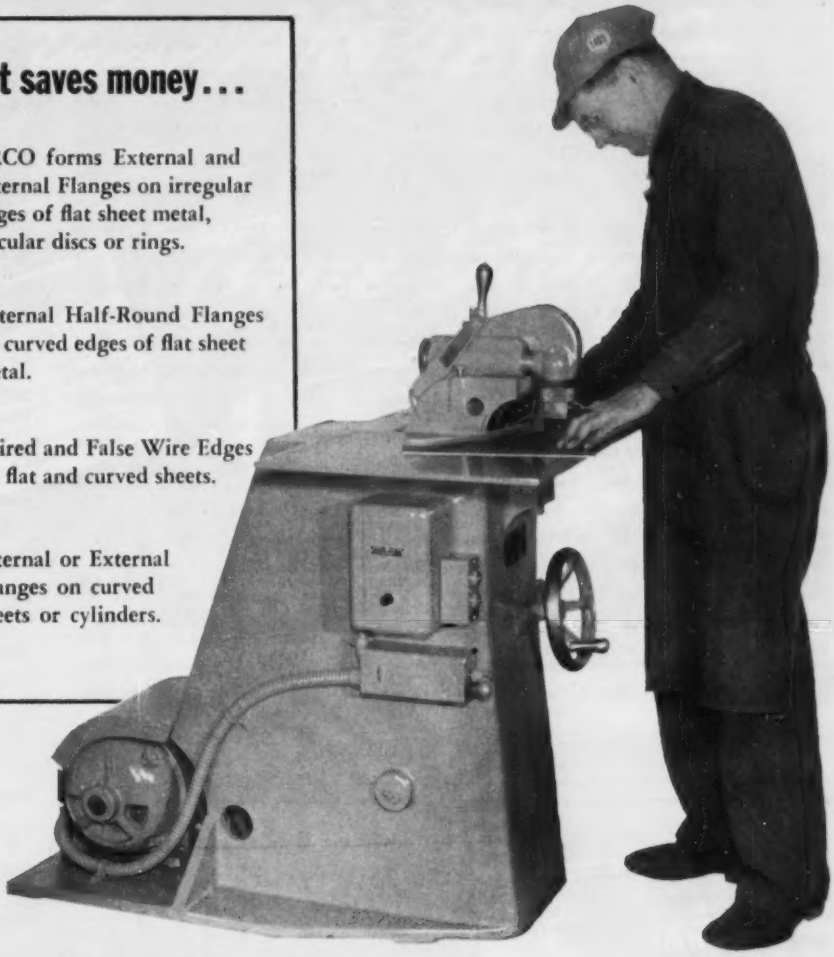


2. External Half-Round Flanges on curved edges of flat sheet metal.

3. Wired and False Wire Edges on flat and curved sheets.



4. Internal or External Flanges on curved sheets or cylinders.



ERCO eliminates costly hand operations...

No longer must difficult forming and flanging operations be limited to costly, time consuming hand production or to expensive power press and die equipment. In a fraction of the time required to do the job by hand, the ERCO MODEL "HD" can form Plain, Return Bend, Flared, Large and Small Bend Radii, Half Round Flanges, and Wired or False Wire Edges on irregular curved and straight edges of sheet metal . . . also Outside and Inside Flanges on circular discs and rings, and on curved sheets or cylinders. Edges produced by the ERCO are smooth and well-formed. The ERCO will handle Soft, Semi-Hard or Stainless Steel, Soft or Semi-Soft Brass, Copper, Soft or Heat-Treated Aluminum Alloys and Monel Metal.

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Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
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Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Columbus Die-Tool & Mch Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. C.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Cross Co., Detroit, Mich.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
La Salle Tool Co., Inc., 3840 E. Outer Drive, Detroit 34, Mich.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy 71, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

SPINDLES, Boring and Milling

Pope Mchry. Corp., Haverhill, Mass.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn.
Mullins Mfg. Corp., Salem, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

(*Continued on page* 392)

Everyone recognizes this as a sign of spring . . .

And smart gear users know this CINTI is the sign of *good* gears made to *your* specifications.

May We Send You Our Brochure?

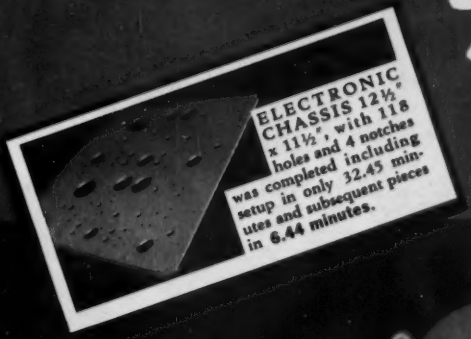
CINTI®

"Gears...Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO

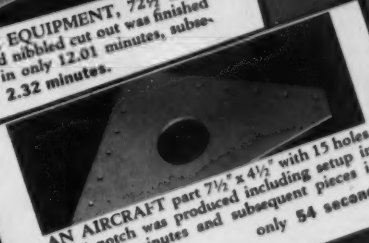
For more information on products advertised, use Inquiry Card, page 257

Check these AMAZING WALES Fabricator Time Studies



ELECTRONIC CHASSIS 12½" x 11½", with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in **6.44 minutes.**

A part of FARM EQUIPMENT, 72½" x 22" with 32 holes and nibbled cut out was finished including setup in only 12.01 minutes, subsequent pieces in **2.32 minutes.**



AN AIRCRAFT part 7½" x 4½" with 15 holes and 1 notch was produced including setup in only 3.52 minutes and subsequent pieces in only **54 seconds.**

Part of an ELECTRIC REFRIGERATOR, 39⅞" x 8½" with 10 holes and 4 notches was fabricated including setup in only 5.61 minutes and subsequent pieces in only **37 seconds.**

● How long would it take you to make a part similar to those shown above?

The difference between your production times and these typical astounding time studies is WALES Fabricators . . . *the only machine of its kind.*

Designed for rapid interchangeability of punch and die sizes for hole punching, notching and nibbling operations, Wales Fabricators permit working direct from blueprints or operation sheets . . . *no templates required.*

It's too big a story to tell here so write today for fully illustrated, functionally colored Catalog 10-AA.

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Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

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American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCK STOPS

Wohlnip Products, Inc., 634 Central Ave., East Orange, N. J.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

(*Continued on page* 394)

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Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

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Waltham Machine Works, Newton St., Waltham, Mass.

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Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE CHECKING EQUIPMENT
Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

SURFACE PLATES
See Plates, Surface

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Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.

SWITCHES
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Tapmatic Corp., 845 W. 16th St., Costa Mesa, Cal.

TAPPING ATTACHMENTS AND DEVICES
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Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thrifimaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

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Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
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Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
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Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield, Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

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Continental Tool Works, Div. Ex-Cell-O-Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

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Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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(Continued on page 396)

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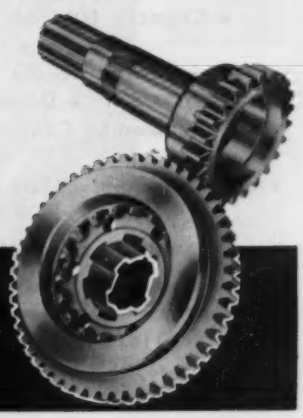

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
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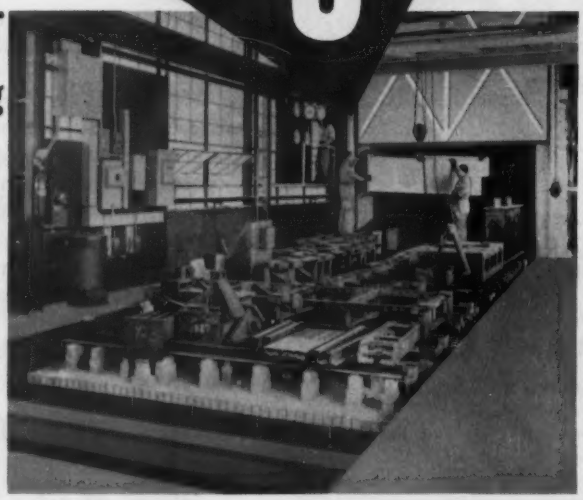

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Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
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(*Continued on page* 398)

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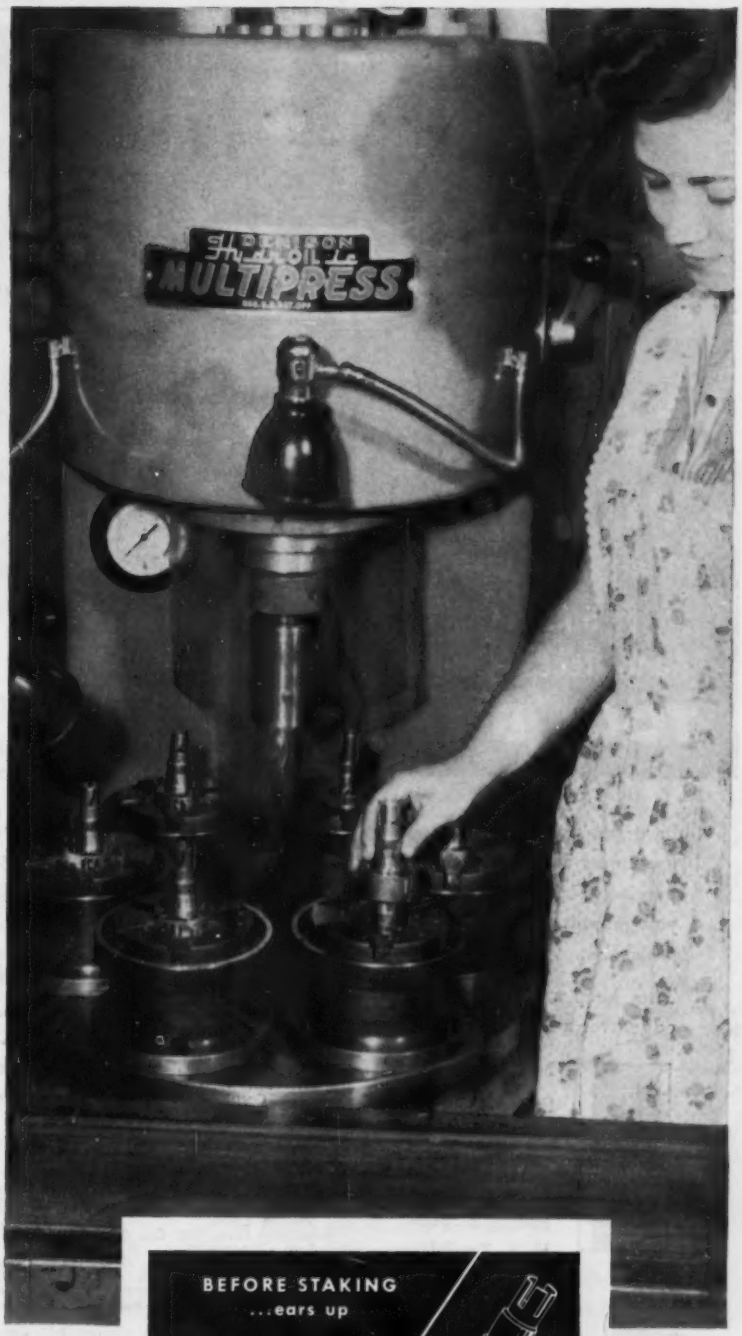

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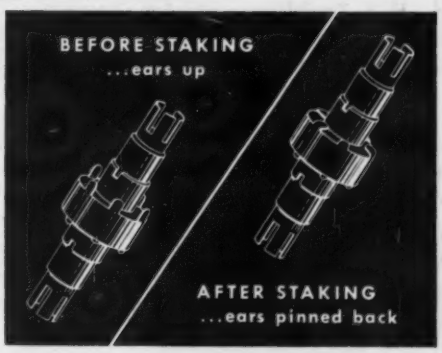

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Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL RESINS

Marblette Corp., 37-33 Thirtieth St., Long Island City 1, N. Y.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Valenite Metals Corp., Box 205, Royal Oak, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Sillman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBE MILLS

Abbey-Etna Co., 2444 Maplewood Ave., Toledo 10, Ohio.
American Electric Fusion Corp., 2622 Diversey Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wassen Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

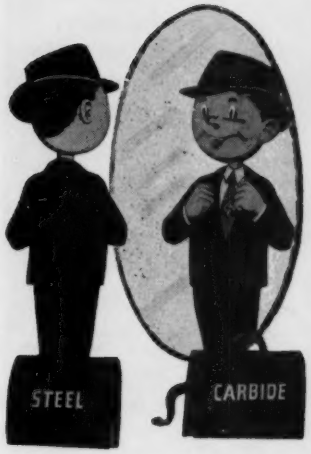
VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Leigh Dr., Easton, Pa.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

(*Continued on page* 400)



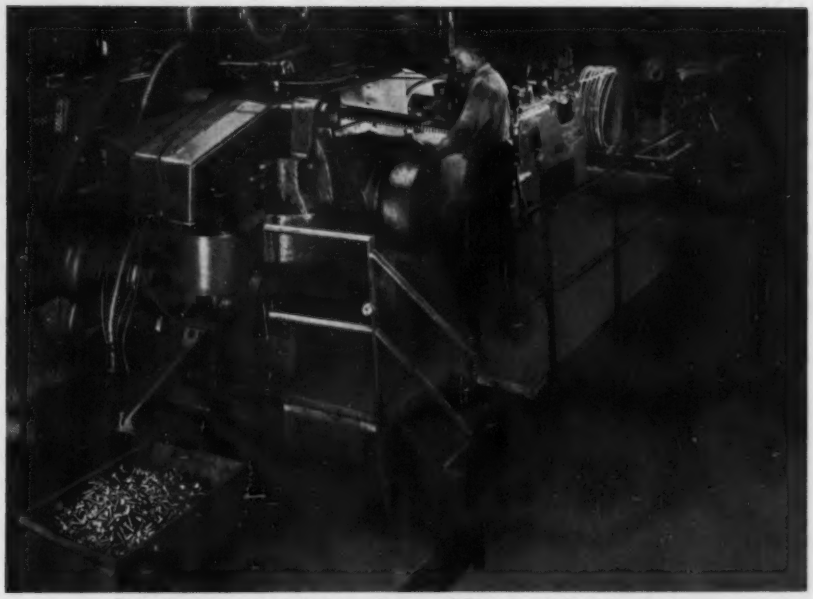


Photo shows automatic bolt maker. Courtesy of Oliver Iron & Steel Corporation.

Mr. Tooley Says:

"It takes two to make a bargain"

How right!

In the field of tools and tooling materials for shaping, forming and removal of metal, Firth Sterling occupies the unique position of supplying *both* steels and carbides to do your job. Thus you *are* always assured of a *bargain* . . . the just-right selection from alternative materials, offered *without bias* from a single source of complete shop tooling.

Cold heading operations, for example, illustrate the point. Either steel or carbide, or both, may be used successfully. But one may have an advantage over the other because of the requirements of the job . . . such factors as quantity of product, geometric design, desired finish, material used and tolerances required. We have *both* steel and carbide. We can recommend the exactly right one, or both, if indicated! Yes, for cold heading "it takes two to make a bargain" . . . Firth Sterling C.H.Q. Steel and Firthaloy Carbide Nibs.

C.H.Q. COLD HEADING QUALITY STEEL

- Controlled hardenability by size
- Controlled carbon content by size
- Special cold heading inspection for good centers
- Safety in heat treatment
- Superior toughness and fatigue resistance

FIRTHALOY CARBIDE NIBS

- Controlled quality
- Made specifically for cold heading applications
- Toughest grade of sintered carbide
- Maximum impact and fatigue resistance
- Good machinability

Your Firth Sterling representative will recommend the best grade of steel or carbide for your applications and product requirements.

R-303

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Chromium Carbides
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Zirconium

CALL YOUR FIRTH STERLING DISTRICT OFFICE OR DISTRIBUTOR. ASK MR. TOOLEY.

For more information on products advertised, use Inquiry Card, page 257

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1400 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2, Mich.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elan and Garrard Aves., Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

WASHERS, Spring

Allmetal Screw Products Co., Inc., 821 Steawrt Ave., Garden City, N. Y. (Stainless Steel only.)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
Federal Mch. & Welder Co., Warren, Ohio
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
Federal Machine & Welder Co., Warren, Ohio.

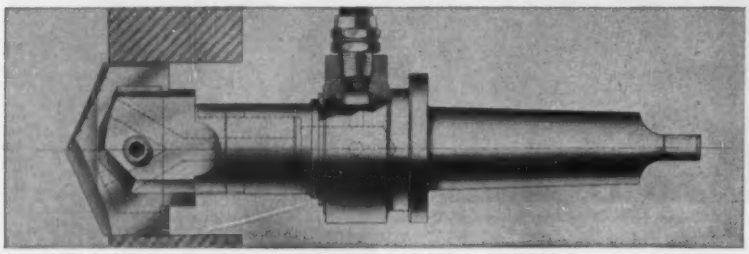
WELDING POSITIONER

duMont Corp., Greenfield, Mass.

WELDMENTS

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Mahon, R. C., Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

(*Continued on page* 402)

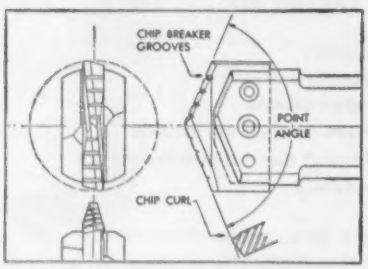


Reduce Costs with Gairing Spade Drills

For drilling large holes and holes in hard and tough materials, Gairing Conner-Type Spade Drills, in stock sizes from 1 to 5-inch diameter, offer many advantages. *They drill from the solid*, and keep on drilling without being retracted to clear them of chips. Their *performance* is based on the great strength of the assembled drills, and on the design of the drill point. Their *economical use* increases with their size, and is based on wide range of stock sizes and interchangeability in only eight sizes of holders.

Spade Drills Have Greater Strength

The spade drill below shows heavy cross sectional strength along a direct line between drill point and shank.



Compared to a twist drill, this design provides great resistance to *end thrust* (for better drilling from the solid), to *torque* (to lessen chipping and breaking through vibration), and to *bending*.

Drill Point Designed for Hard Work

Spade drill cutters are furnished finished ground with these features: *small dead center* minimizes end thrust, *cutting angles* (point angle and rake) provide better support of cutting edges, *chip breaker grooves* keep chips narrow, *chip curls*, ground parallel to cutting edges, break chips short.

A Rugged Tool for General Work

A rugged tool for all large hole drilling in tool rooms and tool and die shops and for shallow production drilling, where coolant can be applied in the conventional way, is shown at the left.

A Tool for Continuous Production

Oil hole drills, rotating or designed for the turret lathe, flush chips from the bottom of deeper holes on production work. Many such drills, like the one shown above with a special oil inductor holder, are made larger than standard for special applications.

Full data on standard drills and examples of deep hole drilling are shown in our Spade Drill Catalog. Write us, or call our representative.

THE GAIRING TOOL COMPANY
Tooling—Standard and Special

21225 HOOVER RD., DETROIT 32, MICHIGAN

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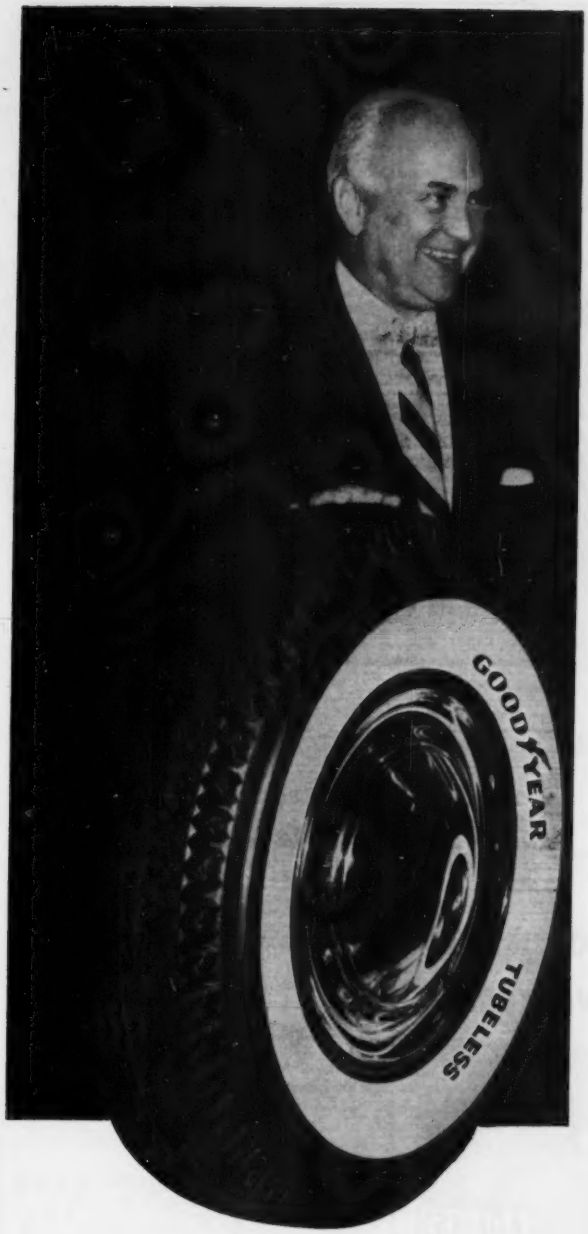

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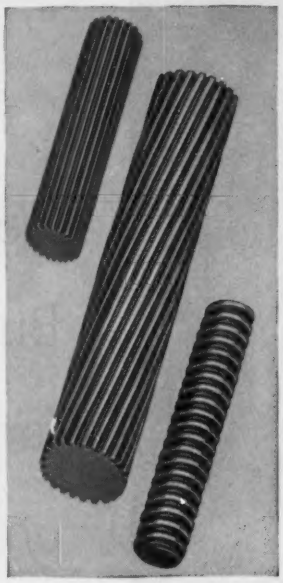
Mass Gear can generate spur, helical and worm pinion rod in all types of material including plastic.

Mass Gear can also produce any type of serrated or special form rod that can be generated.

These rods are available up to 6 feet in length, from 5/32" to 1 ¼" in diameter.

Mass Gear products are made to A.G.M.A. standards, thus insuring uniform quality.

Illustrated brochure showing interesting designs and suggestions available upon request.



G&T Massachusetts Gear & Tool Co.
WOBURN, MASS.

We're Glad TO BE KNOWN BY THE COMPANY WE KEEP!

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No obligation.

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Check our Stampings Division — for short run or high production stampings.

Here are a few of our older customers — who with hundreds of other companies use the foolproof, accurate Laminated Shim method to gain exact fit and save time in assembly . . . and at the same time gain a "built-in" adjustment for service wear. Get the full story — find out why so many design leaders specify **Laminated Shims!**

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American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (American Steel & Wire Co. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

WORM DRIVES
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

WRENCHES, Ratchet
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Tap
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.

WRENCHES, Torque Measuring
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

ZINC
New Jersey Zinc Co., 160 Front St., New York, N. Y.

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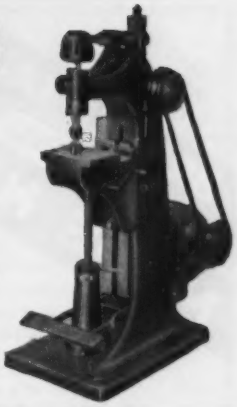
Noiseless Rivet Spinning Machines

GRANT PIONEERS IN RIVETING

OVER 50 YEARS' EXPERIENCE

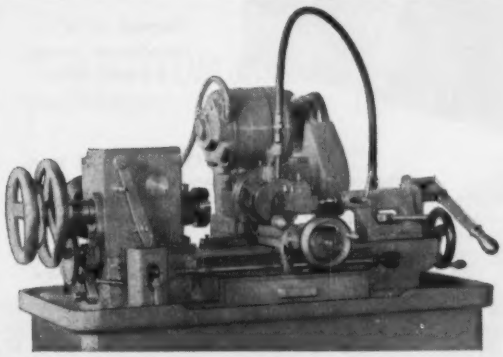
BOTH SPINNER AND HAMMER TYPES
Single and Multiple Spindles—Vertical and Horizontal—Automatically or Foot-Operated. Handles rivets from the smallest and most delicate up to ¾" diameter.

Rotary Vibrating Riveters



THE GRANT MFG. & MACHINE CO.

N.W. Station **Bridgeport 5, Conn.**



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For profitable small part thread milling—use the Waltham Thread Miller. We have recently made a number of changes in the design of these machines that add to their operating efficiency and improve their appearance. New pedestal design eliminates need for having access to rear side, permitting machines to be placed back-to-back or against a wall. Spindle speeds are regulated from 0.5 to 5.75 rpm by easily accessible but covered pick-off gears.

These and other important changes are all described in supplementary bulletin M, which illustrates the whole machine. Send for your copy.

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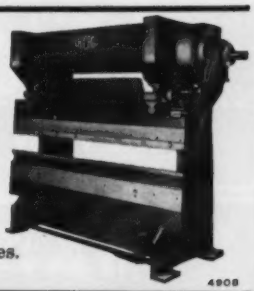
CHICAGO

STEEL PRESS BRAKES

43 Standard Sizes

DIES Punching and Forming for All Makes and Sizes of Press Brakes.



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Send us your old drills—we'll make them new again at a fraction of the cost of a new drill! Exclusive NU-TANG* process replaces twisted or broken tangs with brand new tangs of correct size—and with GUARANTEED ORIGINAL STRENGTH. No welding—No distortion—No shortening of drills—No sleeves. Any drill, reamer, or other tool with a Morse taper in sizes 2 to 6 can be repaired perfectly this quick new way. Delivery—One week. Used by many leading industrial plants. Amazingly low cost—satisfaction guaranteed! Send for complete information.
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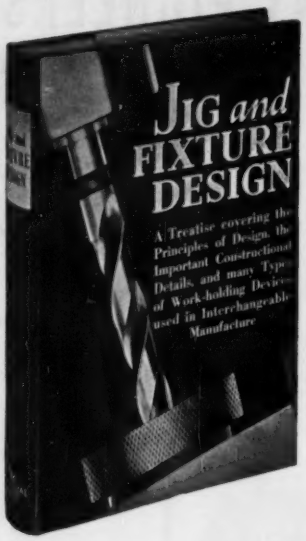
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The Right Answers to Your Jig Design Problems

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327 Illustrations

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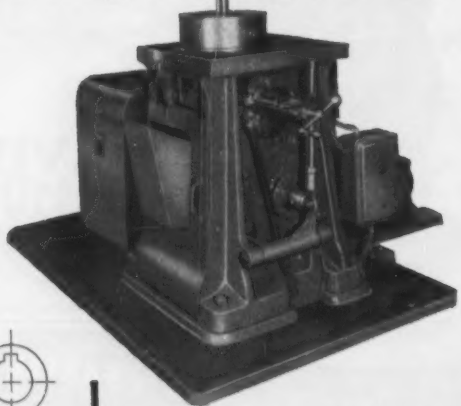
The Industrial Press
93 Worth St. • New York 13, N. Y.

M&M giant keyseaters



M & M Giant Keyseaters cut internal keyways or splines in the bores of pulleys, gears, flywheels and other machine parts. Fast, accurate operation. Built in a wide range of sizes. Special fixtures and cutters available for unusual shapes and taper work. Write today for complete information.

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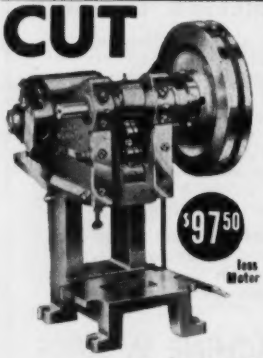

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Overall height 19⅝" . . . Base size 9" x 8¼" . . . Die bed 6¼" x 8" . . . Ram face 1½" x 3½" . . . Ram stroke ¾" . . . positive ¾" ram adjustment . . . sturdy, single pin, non-repeat hand lever clutch. V-belt drive. Weight 105 lbs. Requires only 1/3 H.P. Motor.

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CAM MILLING MACHINES
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PROFILERS
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MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

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Rowbottom for Cams

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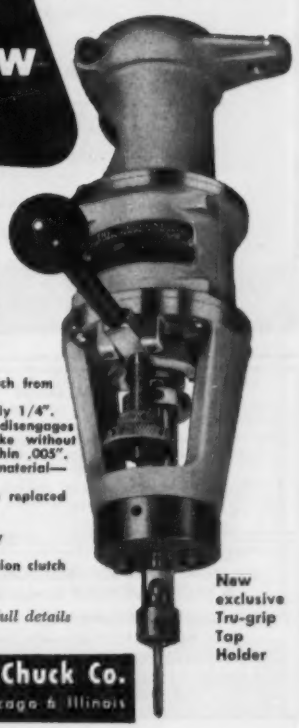

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No. 64SA2 Fellows, m.d.
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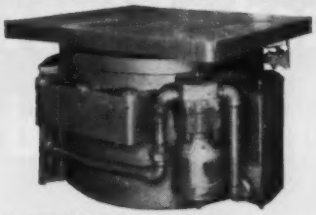

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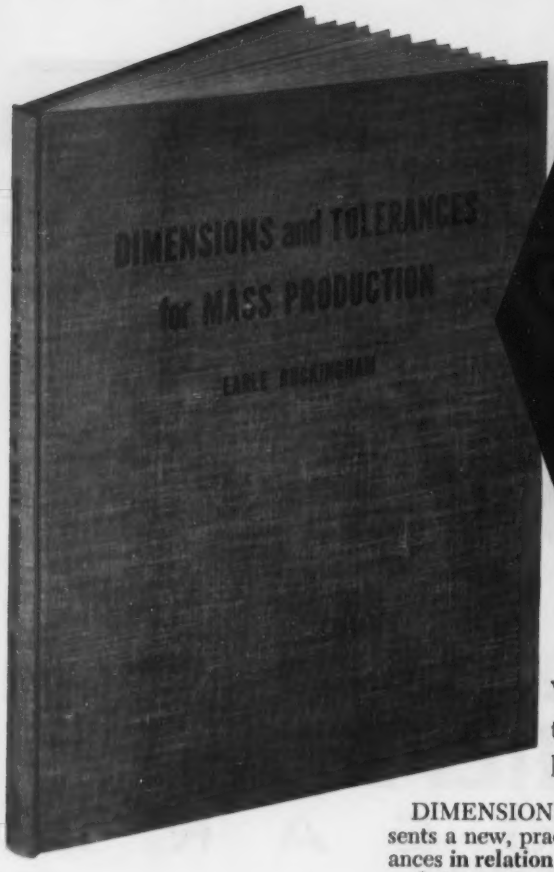

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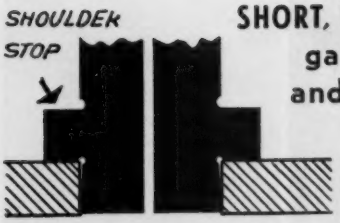

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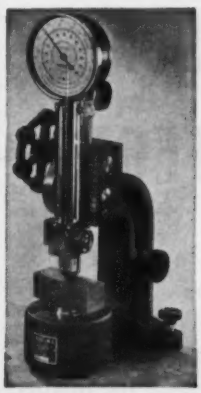

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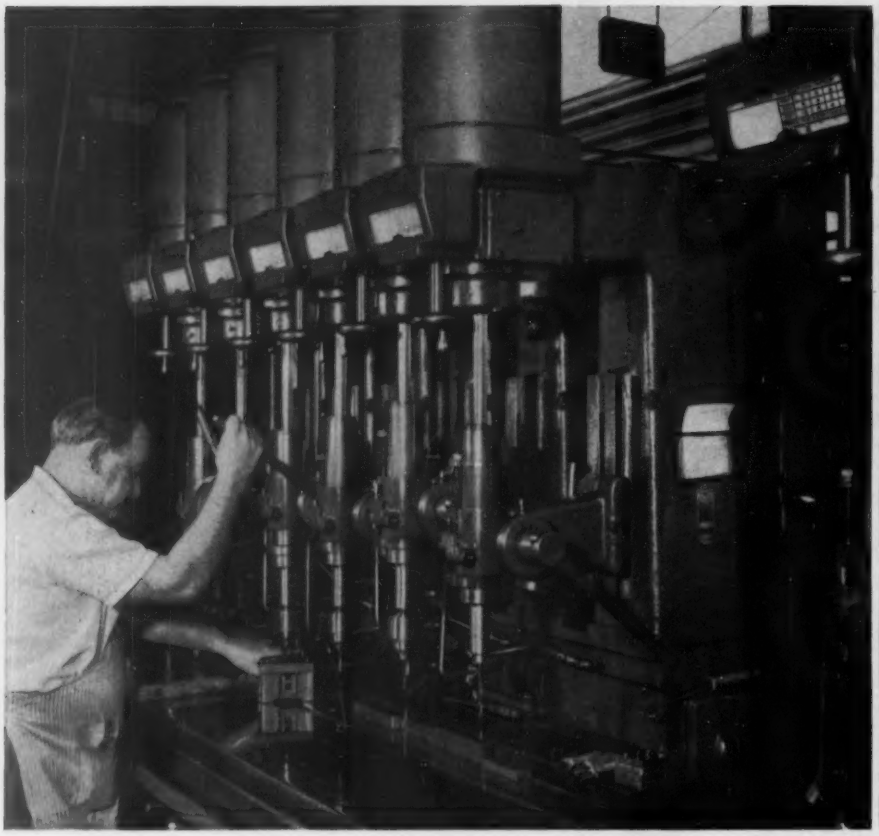

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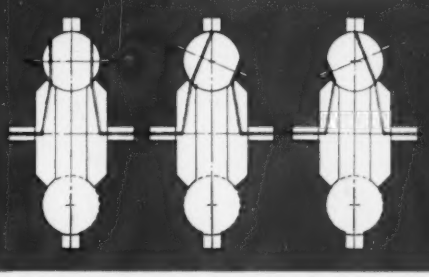

Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts.

Relative speeds of the shafts are adjusted by changing the positioning of axles on which the balls rotate (see diagrams, left, and cutaway view, right).

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Grinds breech of 4,000 lb. gun barrel

TIMKEN® bearings on work spindle hold runout within .0007"

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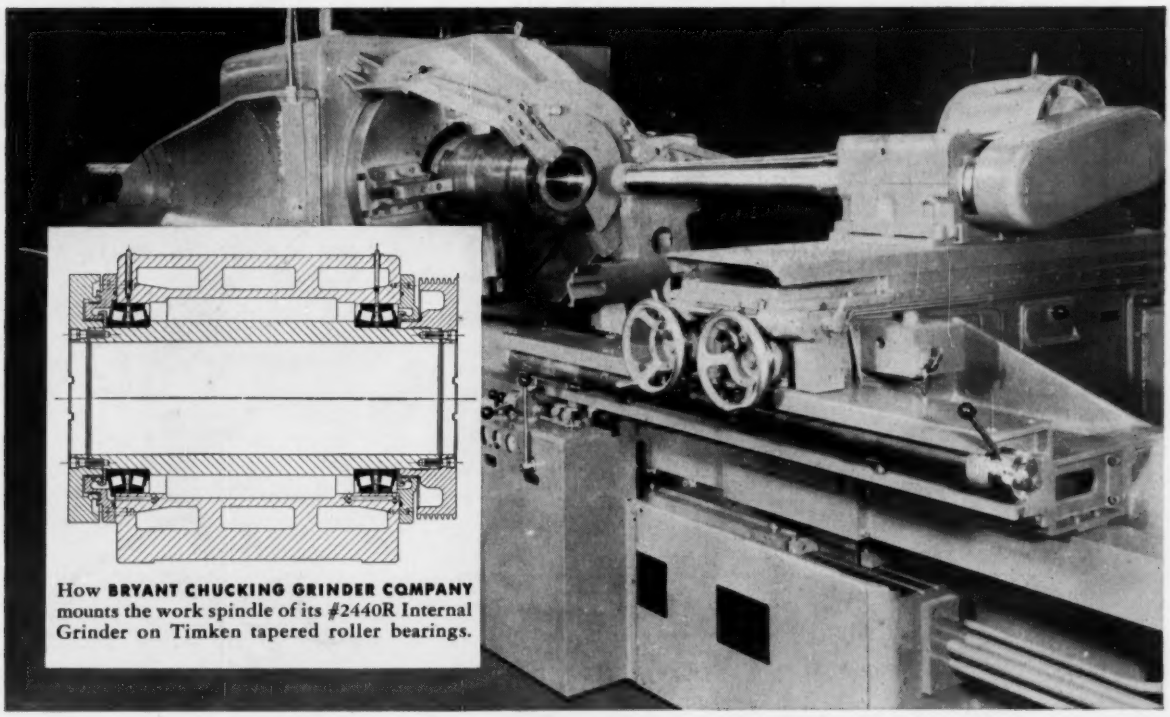
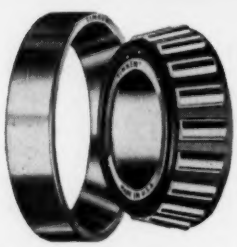
TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



How **BRYANT CHUCKING GRINDER COMPANY** mounts the work spindle of its #2440R Internal Grinder on Timken tapered roller bearings.



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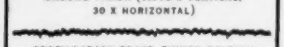
TAPERED ROLLER BEARINGS

PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)



PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)

OPTICAL FLAT, PERFECT FINISH

SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

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